

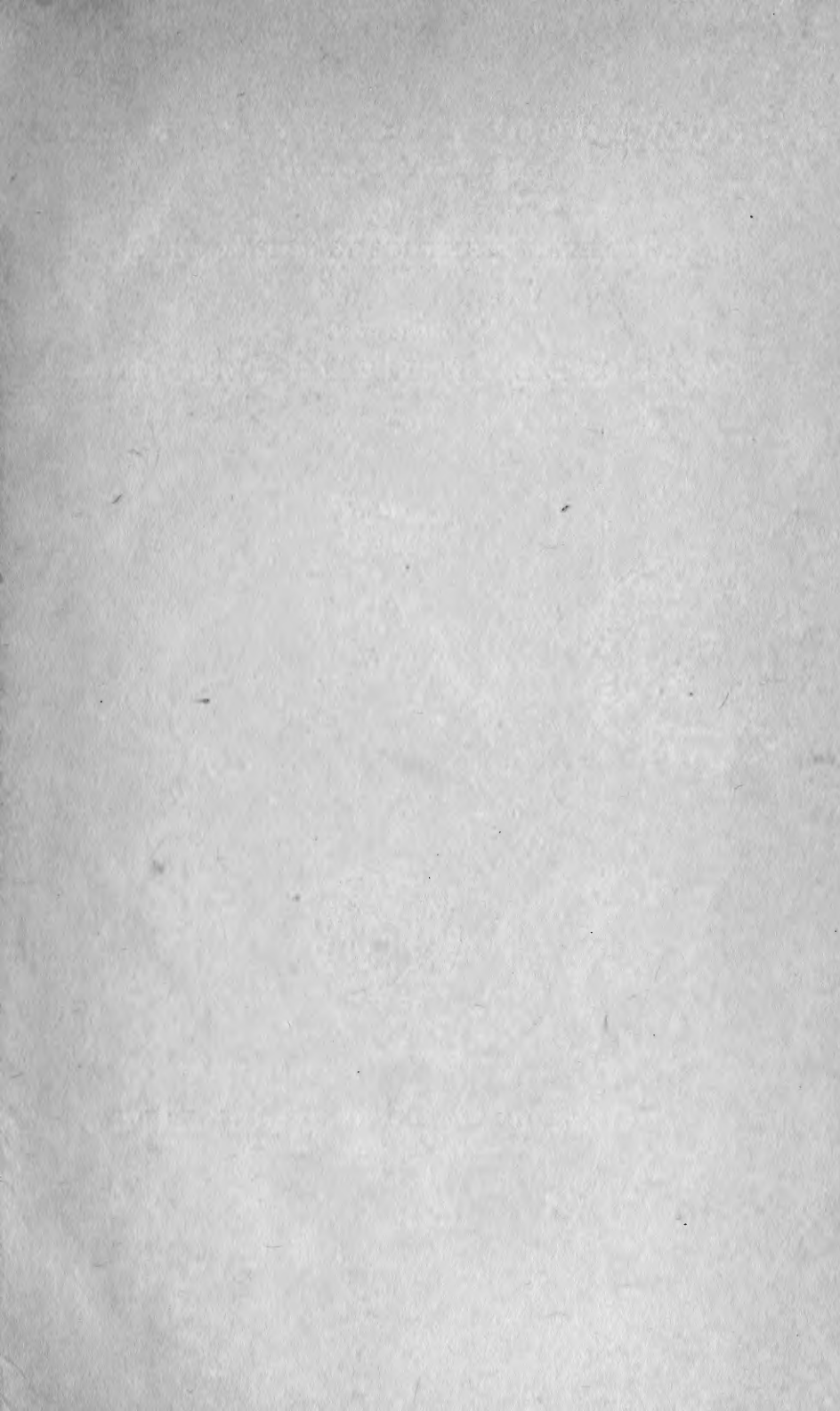
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PAGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935, IN 1936, IN 1937, AND IN 1938.

## THREE NEW ANOMURAN CRABS FROM THE GULF OF CALIFORNIA, *Lucania*

*By* STEVE A. GLASSELL

THE UNIVERSITY OF SOUTHERN CALIFORNIA PUBLICATIONS

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LOS ANGELES, CALIFORNIA



# THREE NEW ANOMURAN CRABS FROM THE GULF OF CALIFORNIA

By STEVE A. GLASSELL

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### FAMILY PORCELLANIDAE

- Genus *Porcellana* Lamarck, restricted  
    *Porcellana hancocki* Glassell, new species

The three species herein described have already been recorded in publication under manuscript names. Therefore, it has been thought best to publish these descriptions at this time, rather than wait for the full report of the collections now on hand.

## PAGURIDAE

Genus **PYLOPAGURUS** M. Edwards and Bouvier

***Pylopagurus spinicarpus*** Glassell, new species

*Pylopagurus spinicarpus* Glassell, manuscript name, Zoologica, N. Y. Zool. Soc., vol. 22 (part 3), no. 16, 1937, p. 256.

*Type:* Male, holotype; Cat. No. 75432, and female, paratype, U. S. National Museum, from Puerto Refugio, Angel de la Guardia Island, Gulf of California, Mexico, 65 fathoms; March 4, 1936; collected by Allan Hancock Pacific Expedition of 1936.

*Measurements:* Male holotype: length from rostrum to tip of telson 14.2 mm., of carapace 4.2 mm., of precervical portion of carapace 2.2 mm., width 2.1 mm.; length of major cheliped 10.6 mm., of merus 2.1 mm., of carpus 2.5 mm., of manus 2.8 mm.; length of eyestalk 2 mm.

*Diagnosis:* Precervical portion of carapace as broad as long, transversely convex, naked, polished, projections subequal. Inner margin of major hand with low, blunt teeth, outer margin a granular ridge; minor hand unarmed. Inner carpal margin of major cheliped armed with two median spines and one distal spine, a concavity between the median and distal spines. Eyes as long as width of carapace, constricted in middle, cornea dilated.

*Description:* Anterior portion of carapace as long as wide, transversely convex, naked, polished; median projection obtuse, slightly depressed, extending to base of eye-scales; lateral projections armed with a minute spinule.

Eye-stalks cylindrical, depressed on upper surface, constricted in middle, cornea dilated, subequal in length to width of carapace. The ophthalmic scales are bluntly triangular and armed with a sharp sub-apical spine, margins entire. The third antennular peduncle extends four fifths its length past the cornea.

The antennal acicle is slight, sharp-pointed, unarmed, lightly setose, and extends to the middle of the cornea. The third antennal peduncle extends more than half its length past the cornea; the flagellum is lightly ciliated.

The major cheliped is three fourths the length of the entire body; merus trigonal, with upper, distal portion rounded and lightly setose, inner and outer lower margins entire; carpus increasing in width distally, inner margin armed with three teeth, two median and one distal, between these groups a wide sinus; the outer margin is nearly obsolete, consisting of a slight ridge joining the outer hinge of the manus, the inner proximal surface is contorted, with a deep, oblique sinus; the hand is three fifths as wide as long, smooth and slightly concave on its operculiform surface and lacks a proximal transverse ridge. The inner margin of the palm is an upturned low-toothed ridge, the outer margin of the hand is unarmed, a simple granulate low crest. The pollex is armed on its cutting edge with a sharp median lobe. The dactyl is crested with a row of low teeth, the largest is proximal. The minor hand extends past the carpus of the major and is one third the width of the latter; merus compressed; carpus with two rows of spines, one on the crest, the other below on the inner side.

The ambulatory legs are unarmed on their upper crests, lightly setose, surface polished, shorter than major chela. The terminal segment of the telson is semioval, entire.

*Color in alcohol:* Buff with red markings.

*Range:* Throughout the Gulf of California, at depths ranging from 40 to 80 fathoms.

*Remarks:* This proposed species is allied to *P. guatemoci* Glassell, 1937, but differs from that species by the major hand being smooth, the inner margin only being armed, the outer a granulated ridge, and with no proximal ridge, instead of being entirely margined with teeth, the surface minutely granulate.

### Genus *PAGURUS* Fabricus

#### *Pagurus bunomanus* Glassell, new species

*Pagurus bunomanus* Glassell, manuscript name, Zoologica, N. Y. Zool. Soc., vol. 22 (part 3), no. 16, 1937, p. 262.

*Type:* Male, holotype; Cat. No. 75433, and female, paratype, U. S. National Museum, from Puerto Refugio, Angel de la Guardia Island, Gulf of California, Mexico, 15 to 30 fathoms; March 4, 1936; collected by Allan Hancock Pacific Expedition of 1936.

*Measurements:* Male holotype: length from rostrum to tip of telson 44.5 mm., of carapace 13 mm., of precervical portion of carapace 6.9 mm., width 7 mm.; length of major cheliped 32.3 mm., of merus 7 mm., of carpus 9 mm., of manus 12.8 mm., width of manus 7.5 mm., length of minor cheliped 24.4 mm., of merus 6.2 mm., of carpus 6.2 mm., of manus 8.5 mm., width 4.6 mm.; length of eye-stalk 5.2 mm.

*Diagnosis:* Precervical portion of carapace urnal. Median spine outline on carapace, slightly advanced past margins and lateral spines. Major hand heavily plated with close-set granules, margined with heavy dull spines, a boss of granules at base of pollex, another at base of dactylus, this last the termination of a longitudinal granulated crest paralleling the inner margin of palm. The minor hand subrhomboidal. The second left ambulatory differs from its mate.

*Description:* Precervical portion of carapace urnal, smooth, nude except for a few tufts of setae, length and breadth subequal; median tooth short, not reaching base of eye-scales, outlined on upper surface of carapace and extending past and above the revolute, widely triangular, distal margin; lateral spines blunt, not advanced past the median. Eye-stalks stout, two-thirds width of carapace, dilated, with three tufts of setae on upper surface. Antennal acicle narrow, setaceous on inner

side, curved, extending to middle of cornea. Ophthalmic scales triangular, with a subapical spine, upper surface concave.

Major cheliped with merus trigonal, two upper distal spines, outer, lower distal end spined, inner distal margin and under surface granulate and rugose; carpus widest distally, surface rugose, with few setae; a few spines parallel inner margin, inner margin armed with forward-pointing spines, twelve or more, outer margin sharply deflexed, rugose proximally, granular distally; hand rectangular, two thirds as wide as long, margined with heavy-based, blunt-ended spines, surface paved with close-fitting, rounded-topped granules, two rows of well-separated tubercles converge near base of a boss at base of pollex; a granular ridge parallels inner margin of palm, ending in a prominent elevation at base of dactyl; the fingers with a median elevation, on either side of which the surface is concave. The minor cheliped reaches slightly past the carpus of the major; the merus is like the major though smaller; carpus narrow, crested with teeth and granular on outer surface; the manus is subrhomboidal, with three dull teeth on the inner margin of palm, the outer margin with six or seven teeth in the median portion, the surface plated as in the major chela and with a few proximal tubercles on the tumid median ridge at the proximal end.

The first pair of ambulatory legs are similar, lightly setose; the carpus with a crest of spines; dactyli compressed, slightly twisted and nearly as long as the carpus and propodus. In the second pair, except for the longer ischium, the right leg is similar to those of the first pair, while that on the left side has a row of heavy granules on the posterior side of the propodus and dactyl, separated by a deep groove from both an upper and a lower ridge of setae.

*Color in alcohol:* Buff with reds and browns.

*Range:* Throughout the Gulf of California. Found in from 15 to 50 fathoms.

*Remarks:* This proposed species is allied to *P. tanneri* (Benedict), 1892, but differs in that the eye-stalks are longer than the anterior border of the carapace, instead of subequal in length; by the antennal acicles being shorter than the eye-stalks, instead of extending past the cornea; by the hands being plated, instead of tuberculated; by the smaller hand being margined with teeth, instead of with spinules; by the second pair of ambulatory legs being asymmetric, instead of symmetric.

In this latter respect *P. bunomanus* resembles some of the species in other genera, such as *Dardanus*, *Coenobita*, and *Diogenes*.

## PORCELLANIDAE

Genus **PORCELLANA** Lamarck, restricted

**Porcellana hancocki** Glassell, new species

*Porcellana hancocki* Glassell, manuscript name, Zoologica, N. Y. Zool. Soc., vol. 22 (part 1), no. 4, 1937, p. 87.

*Type*: Male, holotype; Cat. No. 72454, and female, paratype, U. S. National Museum; from entrance to Angeles Bay, Baja California, Mexico, 25 fathoms; March 3, 1936; collected by Allan Hancock Pacific Expedition of 1936.

*Measurements*: Male holotype: length of carapace 6.3 mm., width 5.8 mm. Female paratype: length 4.8 mm., width 4.2 mm.

*Diagnosis*: Carapace slightly convex, high in center, lateral margins sharp, upturned. Front tridentate, horizontal. Chelipeds slender. Ambulatory legs long.

*Description*: Carapace longer than wide, slightly convex, with gastric regions highest, slightly rugose, a small whorl on each side of the cardiac region; lateral margins slightly upturned, a sharp, deep, narrow, V-shaped notch at terminus of the cervical groove; a transverse line of tomentum behind the front; front tridentate, median tooth triangular; a shallow median sulcus extends to near the distal end; it is longer than the lateral teeth and separated from them by a wide, V-shaped notch; the lateral teeth slightly diverge, their outer margins form in a sweeping curve, the upper orbits for the eyes, their inner margins, with those of the median tooth, form a graceful "W"; a post-orbital tooth. Eyes large; stalks thick, short. Antennae long. Epimera fringed with tomentum.

Chelipeds rather slender, narrow; merus armed at distal inner end with a vertically pointed, sharp tipped, compressed lobe, its tip exceeding the plane of the carpus; carpus longer than wide, armed with a single low tooth whose longest margin is proximal, the surface microscopically, transversely striate; the ventral inner surface is also armed with a tooth, as is the dorsal, a concavity between these surfaces for the reception of the inner part of the hand; hands similar, unequal, the right (in the holotype) the larger, a ridge on the inner margin to base of dactyl, a median ridge from proximal end to gape; from this ridge to outer margin the hands are tomentose, the margin fringed with serrate granules and pinnate setae to tip of upturned pollex; the dactyli are sinuous, with sharp, curved tips; palms of hands smooth.

Ambulatory legs rather long, lightly crested with tomentum in tufts; the propodi nearly one and one-half times as long as the carpus; carpus subequal in length to dactyli; dactyli long with slightly curved corneous tips, and armed on the under side with a row of supplemental corneous spines.

The outer maxillipeds have their ischium transversely striate.

*Color in alcohol:* Carapace with orange-red blotches on a cream-colored ground. Propodi of ambulatories banded. Ventral surface slightly iridescent.

*Range:* West coast of Mexico, at depths from 20 to 50 fathoms.

*Remarks:* This proposed species is allied to *P. sigsbeiana* A. M. Edwards, 1880, and is undoubtedly the Pacific analogue of Milne Edwards' species; it differs in having two small verticils on the carapace, instead of being smooth; by having the ventral inner surface of the carpus of the chelipeds subsimilar to that of the dorsal surface, both bearing spines, instead of the dorsal alone; and by the carapace not being marked with longitudinal stripes. The bathymetric range in both species is the same.

This proposed species is dedicated to Captain Allan Hancock, patron of science, whose interest in the marine fauna of the Pacific coast has been responsible for the extension of our horizons.



REPORTS ON THE COLLECTIONS OBTAINED BY ALLAN HANCOCK PACIFIC EXPEDITIONS OF  
VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA, AND GALA-  
PAGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935, IN 1936, IN 1937, AND IN 1938.

## NEW BRACHYURAN CRABS FROM THE GALAPAGOS ISLANDS

(PLATES 1-10)

*By* JOHN S. GARTH

THE UNIVERSITY OF SOUTHERN CALIFORNIA PUBLICATIONS

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# NEW BRACHYURAN CRABS FROM THE GALAPAGOS ISLANDS

(PLATES 1-10)

By JOHN S. GARTH

Research Associate  
Allan Hancock Foundation  
The University of Southern California

## INTRODUCTORY REMARKS

By previous arrangement with Dr. Mary J. Rathbun, preliminary descriptions of three new species of oxystomatous crabs collected in the Galapagos Islands by Allan Hancock Expeditions prior to 1935 appeared in the Proceedings of the Biological Society of Washington, vol. 46, p. 183, (1933), and vol. 48, pp. 2-3, (1935), and were reviewed with figures in Bulletin 166 of the U. S. National Museum. In keeping with the policy of making expedition results immediately available, it has been thought advisable to publish the corresponding section of the nonoxystomatous crabs at this time, rather than to await the final report on the Hancock Brachyura.

Color notes given are according to Ridgway, *Color Standards and Color Nomenclature* (1912), and were made from living specimens at the time of capture by Mr. Anker Petersen, staff artist of the Allan Hancock Foundation, whose illustrations accompany this paper.

The writer wishes to acknowledge his indebtedness to Dr. Waldo L. Schmitt and Dr. Fenner A. Chace, Jr., for facilities placed at his disposal while consulting the collections of the U. S. National Museum and the Museum of Comparative Zoölogy, Harvard, during the summer of 1937, and to Dr. Mary J. Rathbun and Mr. Steve A. Glassell for helpful advice during the preparation of the manuscript.

## *MAJIDAE*

Genus *ANOMALOTHIR* Miers  
*Anomalothir hoodensis*, new species  
Plate 1, Figs. 1-4

*Type:* Female, holotype, Cat. No. 381, and male, allotype, Allan Hancock Foundation, The University of Southern California, from north of Hood Island, Galapagos, Latitude 1°20' S., Longitude 89°40'

W., 140-160 fathoms; January 29, 1938; collected by Allan Hancock Expedition of 1938 at Station 817-38.

*Measurements:* Female holotype: length of carapace including rostrum 10.8 mm., width of carapace 5.6 mm., length of rostrum measured from level of preorbital spines 3.4 mm., width of rostrum at same level 1.5 mm., length of cheliped 12.6 mm., of first ambulatory 21.8 mm. Male allotype: length 9.6 mm., width 5.0 mm.

*Diagnosis:* Postorbital spine longer than preorbital. Third and fourth legs of approximately equal length. A single spine on the carpus of the cheliped. Merus of the third leg entire. Carapace little produced posteriorly; no tubercle in front of posterior margin.

*Description:* Carapace smooth and bare, regions faintly indicated. Cardiac area slightly more elevate than gastric when seen in profile. Rostrum curving gently downward, its length little more than twice its breadth measured from the bases of the preorbital spines; horns cleft to base but contiguous the greater part of their length, diverging slightly in their distal third and bearing a row of short setae on their outer margins. Basal article of antenna visible in dorsal view. Preorbital spine minute, postorbital spine prominent. Eyes large, eyestalks constricted at base of cornea. A few scattered spinules on hepatic and branchial areas. Posterior margin but little protruding; no spine or tubercle at posterior median angle.

Merus of cheliped armed with five stout spines beneath. Carpus with but one spine, superodistal. Manus moderately inflated in female; dactyl three fourths as long as propodus; fingers gaping in a broad oval at base. First ambulatory much the longest, over twice the length of the carapace, including rostrum; second ambulatory one and two-fifths times the length of the carapace; third and fourth legs shorter, subequal, the third being infinitesimally shorter than the fourth, its merus less robust. Dactyl of first ambulatory more than four fifths the length of the propodus; that of the second, three fourths the length of the propodus, dentate; dactyls of legs three and four little more than one half as long as of leg two, also dentate.

Antennae extending beyond the rostrum, basal article narrow, antennal spine minute. Antennular fossae large, incompletely divided, a notch at their bases. A prominent tubercle lateral to each green-gland opening. Several tiny spines on pterygostomian region. Merus of third maxilliped rounded at outer angle; ischium and merus spinulose along inner border, joints of palpus shortened, robust.



*Color in life:* Carapace clear pearly gray. Numerous orange-red dots along mid-line and continued on rostrum. Eye dark purplish red with green highlights; a few red dots on eyestalk. Merus of ambulatories banded with similar dots. Chela with faint tint of orange along upper surface. (Petersen)

*Range:* Eight specimens of the species, which was encountered by the 1938 expedition only, were dredged at Hood, Barrington, and Daphne Minor islands, Galapagos, in depths of from 20 to 160 fathoms.

*Remarks:* This species is the Pacific counterpart of the Atlantic species, *A. frontalis* (A. Milne Edwards) (1879), from which it may be distinguished by the equal lengths of the third and fourth legs, the single carpal spine, and the less produced posterior margin, which is devoid of a tubercle. Dr. Fenner A. Chace, Jr., has co-operated in the comparison of Hancock material with specimens in the Harvard Museum of Comparative Zoölogy.

Genus **PODOCHELA** Stimpson

**Podocheila schmitti**, new species

Plate 2, Figs. 1-4

*Type:* Male, holotype, Cat. No. 382, Allan Hancock Foundation, The University of Southern California, and one male and one female, paratypes, from north of Hood Island, Galapagos, 20-40 fathoms; January 28, 1938; collected by Allan Hancock Expedition of 1938 at Station 814-38.

*Measurements:* Male holotype: length of carapace including rostrum 12.8 mm., width of carapace 7.9 mm., length of rostrum 2.5 mm., of cheliped 14.6 mm., of first ambulatory leg 34.0 mm. Female paratype: length of carapace 12.3 mm., width 4.7 mm.

*Diagnosis:* Two prominent tubercles, one cardiac, one gastric; in front of the latter a lesser tubercle. Palms spinulous. Rostrum acuminate, typically bifurcate. First ambulatory of male two and one-half times length of carapace. Postorbital spine large, laciniate; hepatic spine cylindrical. Basal antennal article spinulous at outer distal angle.

*Description:* Carapace smooth, pyriform, elevations separated by shallow grooves of which the gastroducardiac seems to form a constriction about the body below the hepatic level. Two prominent setose tubercles or spines, one cardiac and one gastric; in front of the latter a smaller tubercle. Gastric region smooth, rounded, declivitous posteriorly, bearing

four tufts of curved setae arranged in a rectangle. Branchial regions flattened, a longitudinal row of curved setae traversing their entire length and a tuft of the same at inner angle. Hepatic region tumid, having the appearance of a mammary structure, and bearing a short, forward-directed, cylindrical, truncate spine. Pterygostomian ridge also provided with a similar, though smaller, spine at its mid-point. Rostrum thick and broadly triangular at base, transversely convex, nearly twice as long as broad, acuminate, the apex prolonged into a slender spine armed with two double rows of curved setae, the outer of which extend almost to the bifurcate tip. Orbits spinulose above, the largest spinule in some specimens becoming a minute preorbital spine. Post-orbital spine large, concave anteriorly, convex posteriorly, outer margin lacinate.

Basal antennal article narrowed anteriorly, a spine or cluster of spinules at external angle, bearing a thick, compressed, granular ridge which parallels the smooth inner, rather than the spinulose outer, margin. Antennae long, slender, provided with long yellow hairs which intercalate with those of the rostrum; second movable joint reaching tip of rostrum. Antennular fossae large, incompletely divided, their anterior margins granulate; interantennular septum bearing a prominent, berried tubercle. Merus of third maxilliped with inner angle produced into a thin, triangular blade, outer angle rounded; first joint of palpus moderately compressed. Segments of male sternum convex, deeply separated, two prominent tubercles at level of coxae of chelipeds. First abdominal segment bearing two median setose tubercles, the remaining segments one each, with the exception of the last, which has none.

Chelipeds of male robust, hairy, and spinulose. Merus trihedral, the curved lower margin armed distally with numerous spines, of which three or four are particularly conspicuous, and proximally with a fringe of hairs continued on the ischium. Carpus provided with two or three prominent tubercles, each bearing a cluster of spinules, of which the superproximal is outstanding in the type specimen. Palm inflated, roughened, a row of five or six spinules along its inner superior margin, another row of finer spinules along its inferior margin, and a transverse row across the palm; finer spinules of outer surface irregularly placed and interspersed with yellow hairs of varying lengths. Fingers gaping at basal half in a broad oval, broken by a prominent tooth on the movable finger, meeting in distal half, incurving; length of the movable finger equaling or exceeding length of palm.

First ambulatory leg longest, equal to two and one-half times the length of the carapace, including rostrum, its superior surface provided with groups of three curved setae evenly spaced, of which 34 may be counted from coxa to dactyl. Second ambulatory little more than half the length of the first, third and fourth ambulatory legs subequal in male type, although less mature male specimens show the fourth leg relatively shorter. Dactyls of first leg straight and approximately one third the length of penultimate segment, tip incurving; dactyls of legs two, three, and four falcate and from one half to two thirds the length of propodi, successively.

Female chelae slender, fingers almost meeting when closed, finely dentate, curving inward. First ambulatory twice the length of the carapace.

*Color in life:* Deep olive buff. (Petersen)

*Range:* The 16 specimens collected by *Velero III* were obtained from Hood, Chatham, Barrington, James, and the Daphne islands, Galapagos, in depths of from 20 to 80 fathoms.

*Remarks:* This species is readily separated from *P. margaritaria* Rathbun (1902), the other member of the genus common to the Galapagos, by the acuminate rostrum, that of *P. margaritaria* being hood-shaped. It is more nearly related to *P. hemphillii* Lockington (1877), from which it may be distinguished by the bifurcation of the rostral tip, the more prominent gastric and cardiac tubercles, the large, lacinate postorbital spine, the cylindrical tubercles of the mammilliform hepatic prominences, the presence of an anteroexternal spine or spinules on the basal antennal article, and the two median tubercles on the first abdominal segment.

I take pleasure in naming the species for Dr. Waldo L. Schmitt, Curator of Marine Invertebrates, U. S. National Museum, and member of three Allan Hancock Expeditions, whose untiring zeal, both in the field and in the laboratory, is a constant source of inspiration to those who work with him.

Genus **EUPLEURODON** Stimpson

**Eupleurodon rathbunae**, new species

Plate 3, Figs. 1-5

*Type:* Ovigerous female, holotype, Cat. No. 77366, U. S. National Museum, from a rocky spit at Gardner Bay, Hood Island, Galapagos;

January 25, 1933; collected by Allan Hancock Expedition of 1933 at Station 27-33.

*Measurements:* Female holotype: length of carapace including rostrum 7.1 mm., width of carapace 5.3 mm., length of rostrum 2.1 mm.

*Diagnosis:* Carapace foreshortened, wider between anterolateral than between posterolateral lobes. No preocular tooth. No small tooth on lateral margin between the two lobes. Distance between anterior lobes greater than distance from the tip of anterior lobe to middle of posterior border.

*Description:* Carapace pentagonal, depressed anteriorly and laterally, leaving a bold cardiogastric ridge and a cross ridge at the hepatic level. A single pair of tubercles on the gastric region, anterior to each a patch of strongly recurved hairs; a small tubercle near the posterolateral lobes and a cardiac one at a slightly posterior level. Lobes and tubercles clavately setose. Hepatic lobes strongly recurved, outer margins forwardly directed, subparallel, tips rounded; width of carapace at middle of anterior lobes greater than between posterior lobes and greater than the distance from the tip of the anterior lobe to the midpoint of the posterior margin of the carapace. Rostrum more than one third as long as the postfrontal portion of the carapace and with an average breadth of one half its length measured from the supraocular swelling, lateral margins raised near tip only, extremity faintly bilobed, lobes rounded, a slight median sulcus indicated.

Antennae almost reaching tip of rostrum. Antennular cavity reaching middle of rostrum, not nearly filled with antennules, and very incompletely divided into two fossae. Merus of outer maxilliped notched at anterointernal angle to receive palpus, first article of palp enlarged and flattened, last two articles small and cylindrical, hidden behind merus.

Cheliped with visible portion of merus and carpus nodose, merus with a lump on superior margin one third from base, carpus with a prominent inner node and one or more superior nodules; propodal finger deflexed, dentate, teeth more numerous and more prominent than those of the movable finger, of which but three or four may be counted.

First ambulatory leg exceeding cheliped in length, its dactyl as long as the propodus. Dactyls of remaining legs shorter, strongly falcate, finely dentate, digital tooth of propodus strong, blunt, and with a hairy tip.

Abdomen of female with three tubercles on first segment.

*Remarks:* This species may be distinguished from *Eupleurodon trifurcatus* Stimpson (1871) by the absence of a small tooth between the two lateral lobes, and from *E. peruvianus* Rathbun (1924) by the greater proportionate anterolateral width as compared with the posterolateral, the less prominently notched front, and the absence of additional tubercles on the gastric and branchial regions. It bears a superficial resemblance to *Epialtus peruvianus* Rathbun (1923) which is not borne out by careful measurement, for the distance from tip to tip of the hepatic lobes is considerably greater than the distance from the tip of the hepatic to the middle of the posterior margin of the carapace, instead of equidistant, if we judge from Rathbun's figure 53i (1925). Because of the depressed carapace, the forward-directed hepatic teeth, and the dentigerous penultimate articles, the species under consideration falls logically into the genus *Eupleurodon* Stimpson rather than *Epialtus* Milne Edwards.

This interesting little crab is named for Dr. Mary J. Rathbun, Associate in Zoology, U. S. National Museum, whose counsel has been invaluable in the preparation of this paper.

## *XANTHIDAE*

Genus **GLYPTOXANTHUS** A. Milne Edwards

***Glyptoxanthus hancocki***, new species

Plate 4, Fig. 1; Plate 5, Figs. 1a, 2a, 3a

*Type:* Female, holotype, Cat. No. 383, Allan Hancock Foundation, The University of Southern California, and male, allotype, from Sullivan Bay, James Island, Galapagos, shore; January 21, 1938; six females, paratypes, same locality and date; collected by Allan Hancock Expedition of 1938 at Station 796-38.

*Measurements:* Female holotype: length of carapace 18.3 mm., width 25.9 mm. Largest specimen (female, asymmetrical): length 25.8 mm., width 38.0 mm. Male allotype: length 18.6 mm., width 26.9 mm.

*Diagnosis:* Elevations sparsely pitted, 3M (of Dana) having but two punctae, both median. Gastric areole independent of inner proto-gastric. Front separated from rest of carapace by a transverse furrow joining orbits. 5L raised above general level of carapace. Teeth projecting but little beyond arc of anterolateral margin.

*Description:* Carapace, chelipeds, and ambulatories covered dorsally with a labyrinth of smooth, elevated ridges separated by deep furrows bordered with a fine pile. Punctae few in number as compared with other members of the genus, 3M having but two, both median, and the cardiac areole also but two, transversely placed. 3M continued forward as a long median spike, not confluent laterally with the inner protogastric ridge. Outer protogastric areole independent of inner, 2L and 3L separated. Front deflexed, the thickened lobes separated from the adjacent posterior areole by a continuous furrow which communicates with the orbital hiatus. 5L slightly higher than the rest of the carapace. Teeth N,T (of Dana) not projecting beyond the arc of the anterolateral border, E,S but slightly projecting. Male abdomen constricted between segments 5 and 6, the transverse ridges of the central portions parallel and not joined to the corresponding prominences on the lateral margins of the abdomen.

Chelae subequal, the tubercles of the hand mammilliform, their bases not tending to coalesce. Fingers of both claws strongly grooved, the four or five large teeth fitting closely together, the movable finger smooth at base. Both ischium and merus of the third maxilliped moderately furrowed, merus strongly notched for insertion of palpus. Dactyls of ambulatories granulate, densely wooly.

*Color in life:* Dark areas on carapace a rich violet carmine, a little more reddish on branchial and posterior areas. Light areas cadmium orange on frontal, gastric, and cardiac regions; branchial and intestinal regions same color but lighter in tone. Chela violet carmine on dark areas; fingers very dark seal brown, fading toward tips, which are almost white. Ambulatory legs burnt lake on dark areas and light cadmium orange on light areas. Nail of dactyl amber. Eyestalk pale orange-yellow; eye blackish brown. (Petersen)

*Range:* The 21 specimens secured by *Velero III* collectors were from Charles, Albemarle, James, South Seymour, and Tower islands, Galapagos, under rocks at low tide.

*Remarks:* While at the Museum of Comparative Zoölogy at Cambridge in the summer of 1937 the writer was afforded the opportunity of examining, through the courtesy of Dr. Fenner A. Chace, Jr., a specimen of *Glyptoxanthus labyrinthicus* (Stimpson) (1860) male, type (M.C.Z. 1295) and of comparing with it Hancock material taken in the Galapagos Islands. Additional specimens collected in Panama by Dr. Maack (M.C.Z. 2218) and S. W. Garman (M.C.Z. 2306) and



identified by W. Faxon as *labyrinthicus* were also examined, as well as a female specimen (M.C.Z. 2219) taken in the Galapagos in June, 1872, by the *Hassler*, of which Rathbun (1930) notes: "slight variation."

The 20 specimens of *Glyptoxanthus* taken at 10 stations of *Velero III* in the Galapagos from 1933 to 1938 inclusive conform to the *Hassler* specimen as regularly as do the Panamanian specimens to the type of *labyrinthicus*, and may be distinguished from the mainland species by a number of distinct features, which are clearly set forth in the diagnosis above. The removal from synonymy of Lockington's *G. meandricus* (1877) by the finding by Glassell of a valid species in the Gulf of California to which the name is applicable shows that the genus may well be represented in Pacific waters, as in the Atlantic, by several species, one of which, according to the evidence now at hand, is indigenous to the Galapagos Archipelago and is herewith described. For comparative studies of carapace designs, fronts, claws, and male abdomens of typical specimens of *G. hancocki* from James Island, Galapagos, *G. labyrinthicus* from Port Utria, Colombia, and *G. meandricus* from Puerto Refugio, Angel de la Guardia Island, Gulf of California, Mexico, see plates 4 and 5.

I take pleasure in naming this species for Captain Allan Hancock, who has given me the unparalleled opportunity of studying the Galapagos crustacean fauna at first hand on five separate occasions.

### Genus **HEXAPANOPEUS** Rathbun

#### **Hexapanopeus cartagoensis**, new species

Plate 6, Figs. 1-4

*Type*: Male, holotype, Cat. No. 384, Allan Hancock Foundation, The University of Southern California, from Cartago Bay, Albemarle Island, Galapagos, 15-18 fathoms; January 22, 1938; collected by Allan Hancock Expedition of 1938 at Station 799-38. Ovigerous female, allotype, Cat. No. 384a, Allan Hancock Foundation, and two females, of which one is ovigerous, paratypes, same locality, 3-6 fathoms; February 14, 1933; dredged by Allan Hancock Expedition of 1933 at Station 74-33. Three males and seven females, of which four are ovigerous, paratypes, same locality, 8-10 fathoms; January 25, 1934; collected by Allan Hancock Expedition of 1934 at Station 187-34.

*Measurements:* Male holotype: greatest length of carapace 5.4 mm., greatest width 7.3 mm., length of major chela 6.4 mm. Female allotype: length 3.9 mm., width 5.4 mm.

*Diagnosis:* Front oblique, lateral lobes prominent. Second antero-lateral tooth low and fused with first, their combined width little greater than that of third tooth. Fourth tooth laterally directed, tip tuberculiform. Fifth tooth reduced, almost postlateral in position. Major chela of adult male without superior crest.

*Description:* Regions of dorsal surface of carapace separated by conspicuous furrows and bearing elevate, transverse ridges. Front advanced, edges thickened, granulate, oblique, a shallow V meeting the median epigastric groove, a prominent lobe at the outer extremities. Inner supraorbital tooth distinctly separated from frontal lobes; space between closed fissures of orbit low and broad, scarcely attaining the level of the outer orbital tooth, which is narrow at base, acute at tip, and outwardly directed. Second anterolateral tooth obsolescent, fused with the first, the two together occupying little more than the width of the third. Third tooth largest, its anterior margin transverse and bearing a suggestion of a denticle at its base, the outer margin straight and posteriorly directed except at base, where it bends sharply inward. Fourth tooth tuberculiform at tip and laterally directed, its anterior margin shorter than the posterior; carapace widest at this point. Fifth tooth reduced and almost postlateral in position, although not so much as in *H. caribbaeus*, and also laterally directed. Posterolateral margins strongly converging. Principal elevations of the carapace bearing sparse hairs and located, in the order of their prominence, as follows: mesobranchial, cardiac, metabranchial, protogastric, mesogastric, and epibranchial.

Chelipeds dissimilar but of nearly equal proportions, the larger strongly inflated, smooth under low magnification, and without the superior crest common in the genus. Carpus also smooth and bare, except for a prominent spine at anterointernal angle, a lump toward the distal end, and a faint outer furrow. Minor chela more compressed than major, its carpus similar. Color of fingers dark brown with white tips; color of fixed finger of major claw terminating abruptly a very little behind the interdigital sinus, that of minor claw extending farther on the hand. Movable finger with a large basal tooth and strongly curved downward to meet the upturned tip of the fixed finger. Movable finger of minor chela long, curved, and slender. The fixed finger of this claw is missing in the type specimen.

Male abdomen with basal segment occupying entire width of sternum, second segment little more than half the width of first, third segment again wider; abdomen narrowing to base of sixth segment, which is broader than long; tip of seventh segment rounded.

In the female allotype the front is more truncate than in the male holotype, the lateral lobes less advanced. The chelae, particularly the major, are less inflated and show a granulate superior crest with a well-defined sulcus.

*Remarks:* This species may be distinguished from *H. caribbaeus* (Stimpson) (1871) by the independent fifth lateral tooth, which is decidedly more than "a section from the posterior slope of the fourth" (Rathbun); from *H. sinaloensis* Rathbun (1930) by the oblique front with lateral lobes, the front of *sinaloensis* being truncate and lobeless; from *H. orcutti* Rathbun (1930) by the reduction of the second tooth, the less granular appearance of the elevations of the carapace and chelipeds; and from all three by the lack of a superior furrow on the large claw of the adult male. Examination of paratypes of *H. setipalpus* Finnegan (1931), kindly loaned by Dr. Isabella Gordon of the British Museum, shows the second lateral tooth almost equally advanced with the first instead of obsolescent, the conspicuous hairy palpus as long as the combined merus and ischium of the outer maxilliped instead of half their length, and the strong tooth of the manus located on the pollex instead of on the dactyl, as shown by figure 2 of plate 6.

### Genus **KRAUSSIA** Dana

#### **Kraussia americana**, new species

Plate 7, Figs. 1-4

*Type:* Male, holotype, Cat. No. 371, Allan Hancock Foundation, The University of Southern California, from Puerto Refugio, Angel de la Guardia Island, Gulf of California, Mexico, 8-10 fathoms; March 20, 1937; one male, paratype, same locality and date; collected by Allan Hancock Expedition of 1937 at stations 705-37 and 706-37, respectively.

*Measurements:* Male holotype: length of carapace 10.9 mm., width 14.7 mm., of front 6.3 mm., length of chela along superior border 8.3 mm., of manus 5.0 mm., of movable finger 6.3 mm., of immovable finger 3.7 mm., height of gape 2.3 mm.

*Diagnosis:* Front bilobed, subtruncate; lobes arched. Carapace one and one-third times as broad as long. Anterolateral margin greatly exceeding posterolateral margin. Orbits reduced to slits dorsally; eyes small. Fingers of nearly equal length, gaping in a broad oval. First segment of palpus of third maxilliped inflated and horizontally compressed. Margins of carapace and legs fringed with long, cylindrical, golden hairs.

*Description:* Carapace broadly oval, one and one-third times as wide as long, strongly convex fore and aft, and smooth and bare to the naked eye, except toward posterior lateral angles, which are traversed by granular ridges. Surface dotted with scattered transverse punctae, more numerous on the frontal and lateral portions of the carapace, which bear clusters of short, forward-pointing, yellow hairs arising from their granulate posterior margins. Granulation becoming more prominent toward lateral margins, where are also found granules not associated with pits. Anterolateral margin greatly exceeding posterolateral, forming an unbroken arc spiked with sharp granules and fringed with long, straight, cylindrical, yellow hairs. Front bilobed, edge granulate, projecting, lobes arched and separated by a deep and narrow median V from which a furrow extends to the gastric region, which is faintly indicated. Orbits poorly developed dorsally, there being but an acute, angular notch through which a minute black eye is visible. Eyestalks subsessile, spinulose distally. Basal antennal article small, posteriorly placed but touching front, and clearly separating antennular pits from orbit, flagellum projecting beyond front for less than half its length. Antennules folding obliquely. External maxilliped fringed with long, fine, yellow hairs, merus rhomboidal, outer angle rounded, inner angle produced, first joint of palpus inflated and horizontally flattened, approximately one fourth as large as merus.

Chelipeds equal in size. Carpus squarish with spinulose inner and distal margins, and a distal fringe of yellow hairs. Manus compressed at dorsal point of articulation with the carpus, in advance of which the crest of the palm rises abruptly, surmounted by two rows of six or seven spinules each, between which grow more yellow hairs. Palms superficially smooth but microscopically granulate, bearing clusters of yellow setae arranged in several rows. Color of fingers dark brown, that of immovable finger continued a short distance on the palm, color fading to white at tips. Fingers strongly curved, meeting at tips, leaving an oval gape more than half as high as long. Each finger provided with

a pair of brushes of curved golden hairs arising from both inner and outer surfaces at equal distances from the tips. Gordon (1934) illustrates a remarkably similar contrivance for *Phymodius laysani*.

Ambulatory legs compressed laterally, fringed with long hairs anteriorly and short hairs posteriorly. Merus with a few scattered spinules above; carpus high, overlapping base of propodus above, crenulate along superior margin, spinulose distally; propodus of last two legs shield-shaped, a cluster of blunt spinules above; dactylus blade-like, triangular in cross section, armed with a double row of spinules, of which one row of six is most prominent, tips straight, horny, yellow.

Male abdomen seven-jointed, segments 3-4-5 fused. First three segments visible in dorsal view.

*Range:* Nine specimens were obtained by Allan Hancock Expeditions from Hood, Charles, Barrington, Albemarle, and James islands, Galapagos; 30 from Puerto Refugio, Angel de la Guardia Island, to Los Frailes, Gulf of California, Mexico; and one specimen from Secas Islands, Panama; depths from 4 to 40 fathoms. Three additional specimens taken in Banderas Bay, Mexico, by the *Stranger* expedition of 1937, led by Capt. Fred E. Lewis, in 5-10 fathoms, are in the collection of Mr. S. A. Glassell.

*Remarks:* This species has been confused by several carcinologists with *Acidops fimbriatus* Stimpson (1871), a *Pilumnus*-like species also white in color and with long, shaggy hair. However, the very long eye-stalks of *Acidops* and its distinctly dentate anterolateral margin are but two of many prominent characters separating it from the species under consideration.

The American form appears to be distinguished from the previously described species of *Kraussia* Dana (1852) by the small eye and much reduced orbits, as well as the long, gaping fingers. It perhaps most nearly approaches *K. intiger* (de Haan) Alcock (1899) which can be easily recognized by the very much reduced finger of the cheliped, described as little better than a tubercle.

Because of the minute size of the Galapagos specimens, the type is selected from the Gulf of California series.

I am indebted to Dr. Fenner A. Chace, Jr., of the Museum of Comparative Zoölogy, Harvard, for a diligent search of the scattered literature on this Old World and Mid-Pacific genus, of which the first American species is here presented.

Genus **MALDIVIA** Borradaile  
**Maldivia galapagensis**, new species

Plate 8, Figs. 1-6

*Type:* Male, holotype, Cat. No. 385, and ovigerous female, allotype, Allan Hancock Foundation, The University of Southern California, from *Pavonia* coral taken inside submerged crater of Onslow Island, near Charles Island, Galapagos, 2 fathoms; January 23, 1938; one male and five females, paratypes, same locality and date; collected by Allan Hancock Expedition of 1938 at Station 804-38.

*Measurements:* Male holotype: length of carapace 3.7 mm., width 4.6 mm., length of major chela 4.9 mm., height 2.4 mm., fronto-orbital width 3.3 mm. Female allotype: length 3.9 mm., width 5.5 mm.

*Diagnosis:* Two denticles on anterolateral margin; posterolateral borders exceeding anterolateral. Granules of cheliped flattened, not arranged in rows; fixed finger of major claw not constricted at base. Minor chela excavate, slender. Merus of third maxilliped subquadrate.

*Description:* Carapace broader than long, slightly convex, polished, faintly granulate anteriorly, regions not indicated, a few fine hairs showing in the region of the front and about the anterolateral borders. Body finely pocked with magenta dots which tend to fade out in alcohol. Two denticles on the anterolateral margin besides the postorbital; a suggestion of a third on the male type considerably farther back. If from this point measurement is made, the strongly converging posterolateral margins are found to exceed the anterolateral. Front broad, slightly deflexed, but faintly divided into lobes, a single or a double transverse row of granules behind it on some specimens. Orbital margins entire. Eyes large, peduncles stout, constricted below cornea. Base of antenna narrow, second movable joint reaching front, antenna not excluded from orbit, flagellum as long as half the front. Efferent ridge strong. Merus of outer maxillipeds considerably broader than long, subquadrate, outer angle rounded, inner angle slightly notched to receive palpus.

Chelipeds grossly disproportionate, the larger turgid, outer surface rough and slightly pubescent. Merus stout and smooth, carpus finely granulate, the granules increasing in size toward the outer distal margin, which is covered in some specimens with a fine pile. Major chela inflated, the lower half of the outer surface bare and microscopically granulate, the granules increasing in size toward the upper margin. Minor chela excavate, about half as high as major, similarly roughened, the

granules becoming acuminate above. Dactyls of the large manus roughened at base, immovable finger strongly toothed, fingers closing with a slight gape, the tips crossing; no teeth on movable finger. Fingers of small hand long, narrow, thin, curved, the knifelike edges meeting their entire length, a single row of setae lining the inner surface of each; tips fine, curved, and overlapping.

Ambulatory legs narrow, laterally compressed, the last three segments sparsely hairy. Dactyls incurving, provided with a proximal projection which neatly overrides a corresponding flange of the propodus, and fringed with plumose hairs.

*Color in life:* Ground color of carapace ivory yellow to cream buff; posterolateral, branchial, and cardiac areas ivory yellow; gastric and frontal regions cream buff with cadmium orange hue, slightly darker on frontal area. A border of clear jasper pink on front, around eye and marginal teeth, fading out on anterolateral margin. This color appears also on intestinal region, but a shade darker. Designs on carapace Eugenia red and grass green on posterior and Brazil red and cedar green on anterior areas. Eystalk cadmium orange, eye dark garnet brown. Cheliped clear creamy white with coral red on merus and carpus. Small granules on hand Indian lake, large tubercles coral pink, lighter on outer surface with yellowish hue, band on distal end spinel red. Fingers hazel brown at base, becoming lighter toward tip. Ventral side clear white with tinge of bluish lavender. (Petersen)

*Range:* The 24 specimens in the Hancock collections are from Onslow Island, near Charles Island, and Barrington Island, Galapagos. All were cracked from *Pavonia* coral.

*Remarks:* The above species is closely allied to *M. gardineri* Rathbun (1911) from which it differs in the following particulars, as shown by a comparison with the type:

(1) Anterolateral denticles less prominent, the second, exclusive of the postorbital, but faintly indicated.

(2) The sharpened, white granules which are so conspicuous on the outer portion of both chelae and at the base of the movable fingers of each hand in *gardineri* are reduced to a flattened paving of granules of the same color as the background, although slightly sharpened on the minor chela, and are not arranged in rows.

(3) Immobile finger of major manus not constricted at base, a feature not mentioned in the description of *gardineri* but discovered by examination of type.

(4) The unusual minor chela similar, but longer than in *gardineri*; in this respect both differ from *M. symbiotica* Borradaile (1903), the type of the genus, the chelae of which are alike.

## PINNOTHERIDAE

Genus **PARAPINNIXA** Holmes

**Parapinnixa glasselli**, new species

Plate 9, Figs. 1-4

*Type:* Female, holotype, Cat. No. 77367, U. S. National Museum, and female, paratype, from "roach" trap, Tagus Cove, Albemarle Island, Galapagos; February 9, 1933; collected by Allan Hancock Expedition of 1933 at Station 66a-33.

*Measurements:* Female holotype: length of carapace 2.8 mm., width 6.5 mm.

*Diagnosis:* Displacement of first ambulatory leg equal to nearly one-half volume of carapace. Fingers long and slender, gaping when closed, a small tooth near tips. Immovable finger curving well downward. Lines separating abdominal segments sinuous.

*Description:* Carapace bare and glistening, 2.3 times as broad as long, anterior and posterior margins subparallel. Front depressed, lobes oblique, a groove behind margin, median furrow not reaching edge of front. Due to configuration of front, the eyes appear anterior to it. Orbits almost circular in shape, orbital hiatus occupied by the minute basal antennal article. Antennules folding obliquely. Buccal area an isosceles triangle with the broad base concealed by the first sternal plate. Ischium of third maxilliped rudimentary, merus broadly triangular, exterior margin finely crenulate and bordered with plumose hairs, first segment of three-jointed palpus with outer margin rounded and bearing similar hairs.

Chelipeds powerful, contours smooth and evenly rounded, carpus and palm of approximately equal width, fingers long and slender, gaping, prehensile edges with a small tooth near tips, immovable finger curved well downward, dactyl a little longer than upper edge of palm.

First ambulatory leg greatly enlarged, its displacement equal to nearly one half the volume of the carapace, merus deeply excavated to receive cheliped, widening distally, carpus swollen tremendously, nearly as wide as long, propodus narrowing distally, dactylus long and slender.



Second and third ambulatories of normal size, propodites fringed with two rows of natatory hairs. Fourth leg reduced in size, its length when extended falling considerably short of the distal end of the merus of the third, its dactyl a mere tooth.

Abdomen seven-segmented, the third and fourth segments widest and of approximately equal breadth; lines between segments sinuous; seventh segment broader than long, tip rounded, resembling *P. asiatica* Sakai (1933).

*Remarks:* This species is near *P. nitida* (Lockington) (1877), but differs in the longer and narrower fingers, the gape of the fingers when closed, the downward curvature of the immovable finger, the greater size of the first ambulatory, and the longer and more slender dactyls of the first three ambulatory legs. The measurements of the holotype are identical with those of a half-grown female of *P. nitida* in the collection of S. A. Glassell.

The capture of two female specimens in a baited "roach" trap attached to a lobster pot and suspended in several fathoms of water suggests that the species, while undoubtedly commensal, does not hesitate to fare forth from its worm tube in search of food.

I take great pleasure in naming this species for Mr. Steve A. Glassell, whose unflagging interest in the unusual habits of these little crabs and whose persistent efforts in searching out a number of so-called "lost" species have resulted in our better understanding of their relationships and peculiar mode of life.

## CYMOPOLIIDAE

Genus CYMOPOLIA Roux

*Cymopolia velerae*, new species

Plate 10, Figs. 1-4

*Type:* Ovigerous female, holotype, Cat. No. 386, Allan Hancock Foundation, The University of Southern California, from off Daphne Island, Galapagos, 70-80 fathoms; January 20, 1938; two males and fifteen females, paratypes, same locality and date; collected by Allan Hancock Expedition of 1938 at Station 792-38.

*Measurements:* Female holotype: greatest length of carapace 6.9 mm., width 9.9 mm., length of second leg 14.3 mm. Largest male paratype: length 4.1 mm., width 4.9 mm.

*Diagnosis:* Abdomen with laminate crests visible in dorsal view. Five anterolateral teeth diminishing rapidly in size posteriorly. Outer suborbital lobe trilobed, inner sinus narrow. Outer slope of frontal lobe continuous with preorbital lobe. Supraorbital teeth broad, truncate. Merus of leg two with distal spine acuminate. Carapace 1.4 times wider than long; a sinuous posterior line of tubercles.

*Description:* Carapace considerably broader than long, depressed and uneven; tubercles distinct, well separated, and tending to form transverse ridges, especially on the cardiac region. Median pair of frontal lobes moderately slender, compressed, acutely rounded, and separated by a deep fissure the size and shape of one of the teeth inverted; the outer two broad, little advanced, and separated from the median pair by a shallow U. The sloping front forms a continuous, though sinuous, line with the broad preorbital lobe which covers the eyestalk. Middle supraorbital lobe granular, broadly truncate, separated from the inner lobe by a deep, inwardly directed V-fissure and from the outer lobe by a similar fissure less inwardly directed and half the depth. Outer orbital lobe slightly more advanced than middle lobe, and not separated from the large, blunt, and forwardly directed exorbital tooth. Anterolateral teeth five in number, excluding the exorbital, small and well separated; the first half the size of the exorbital, the second half the size of the first, the remainder diminishing rapidly to the fifth, which again is larger than the fourth, lobate, and at the lateral angle. Outer slope of each tooth obtusely bent from outwardly directed at base to inwardly directed near apex. Tubercles of carapace located as follows: the four largest form an arc with a wide radius across the cardiac region; four smaller tubercles form an arc of smaller radius across each mesobranchial region; a single tubercle occurs on each epibranchial and on each hepatic region; two are located behind the front; nine occur on the gastric region, of which two are epigastric; four at the level of the first anterolateral tooth, a single median one just posterior to them, and two opposite the third anterolateral tooth; a single median intestinal tubercle, and a sinuous line of finer tubercles immediately above the posterior margin.

Lower margin of orbit oblique, divided by a narrow V-shaped sinus into two lobes, the outer trilobed, granulate, the inner rounded, advanced, its base hidden by the broadly lobate pterygostomial process. Merus of maxilliped with outer angle much produced, inner angle less so.

Chelipeds feeble, equal in size, and similar in sexes. Granules of outer surface of hand chiefly in two rows.

First leg short and slender, its dactyl reaching but little beyond the carpus of the second, merus rough, bearing an acute tooth at its distal extremity. Second leg longest, 1.4 times the width of the body, its merus robust, cristate, and bearing a large, acutely angled, acuminate spine distally. Third leg similar to second, its merus slightly shorter and two thirds the width of the second, the distal meral spine rectangular. Carpus of legs two and three long and narrow, proximal lobes less produced than distal; propodus widening distally; dactylus of leg two with posterior margin almost straight, of leg three more noticeably sinuous.

First three segments of female abdomen carinate, the first carina having a shallow lobe behind each corner of the carapace, the second forming a median lobe, the third projecting both laterally and medially. A prominent sternal plate visible in dorsal view at base of third walking leg.

*Range:* The 106 specimens at hand come from Hood, Chatham, Indefatigable, Albemarle, James, South Seymour, Daphne Minor islands, and pelagic stations, Galapagos, in depths of from 3 to 150 fathoms.

*Remarks:* A small species, more closely related to *C. sica* A. Milne Edwards (1880) than to any of the known Pacific forms because of the laminate crests of the abdomen, the configuration of the frontal and orbital teeth, and the peculiar sternal plate at the base of the third walking leg. Not to be confused with *C. zaca* Glassell (1936), although the number and arrangement of the anterolateral spines are similar. The proportion of the breadth to the length of the carapace, and of the length of the ambulatories to the width of the body, will suffice clearly to distinguish these two.

This species is christened *velerae* in honor of the Allan Hancock Expedition cruiser, *Velero III*, whose name is a byword in every bay from San Diego to Southern Peru, as well as in the Galapagos Islands.

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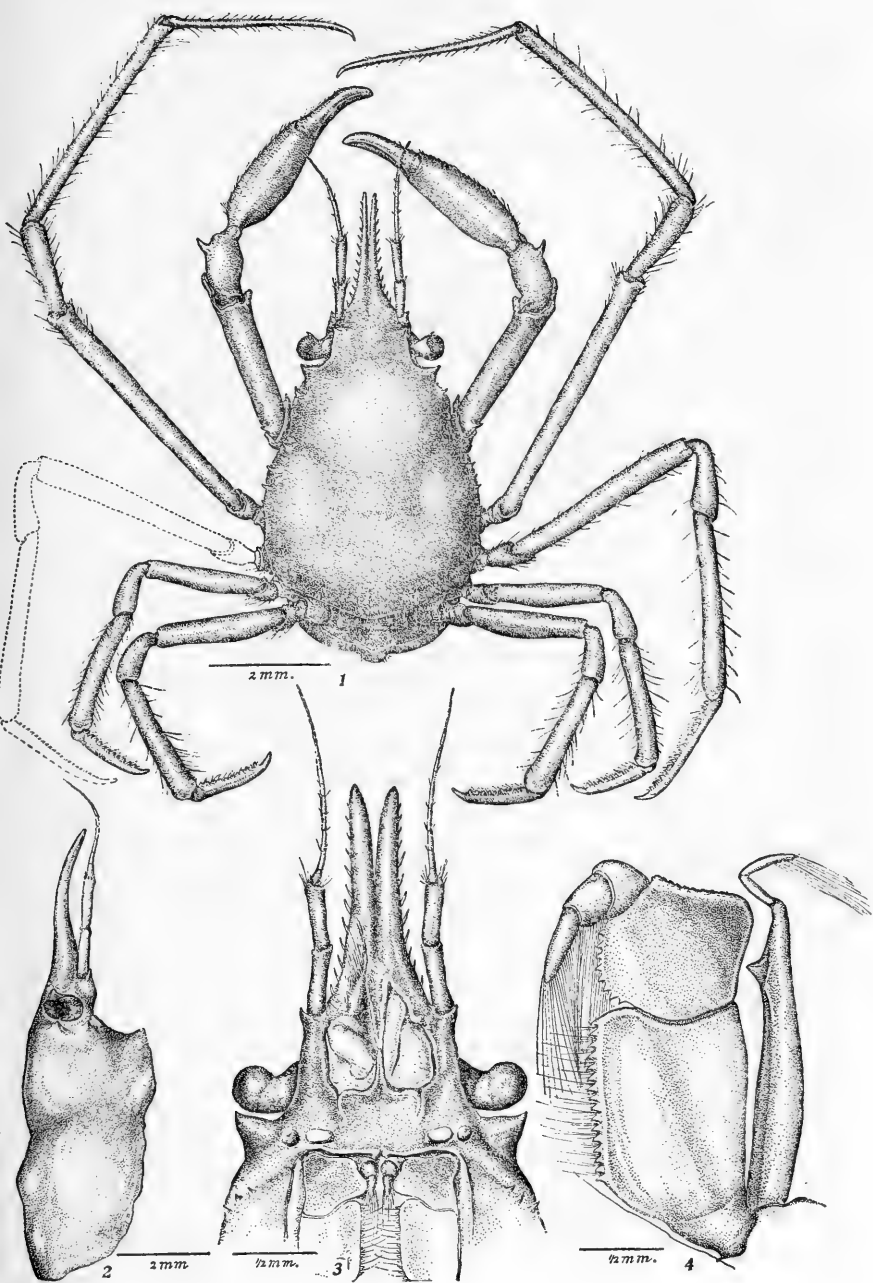
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## PLATE 1

*Anomalothir hoodensis*, new species  
Female holotype

- Fig. 1. Dorsal view
- Fig. 2. Lateral view of carapace
- Fig. 3. Ventral view of front
- Fig. 4. Left outer maxilliped



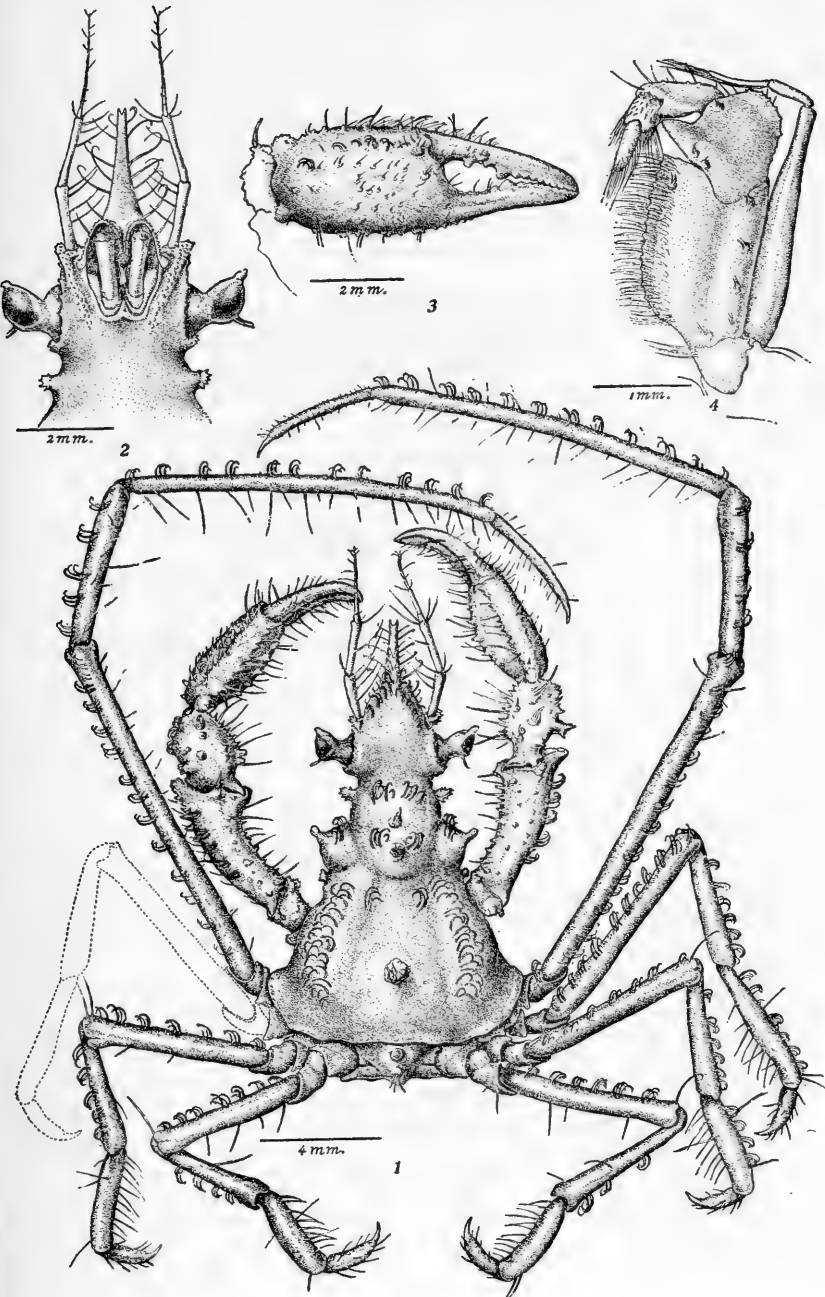
## PLATE 2

*Podochela schmitti*, new species

Male holotype

- Fig. 1. Dorsal view  
Fig. 2. Ventral view of front  
Fig. 3. Right chela  
Fig. 4. Left outer maxilliped

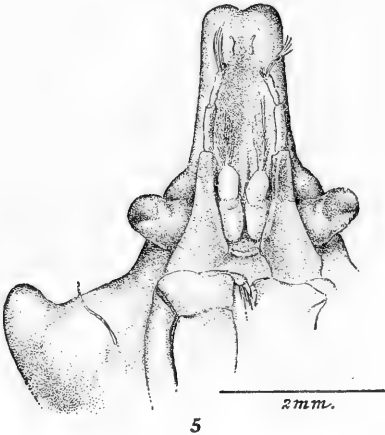
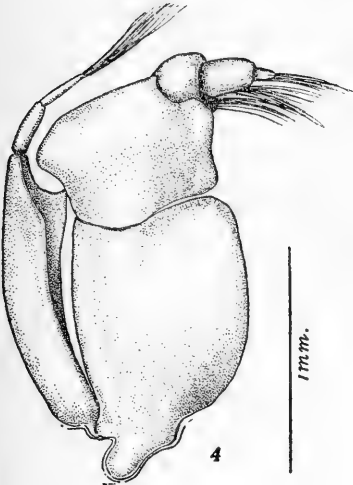
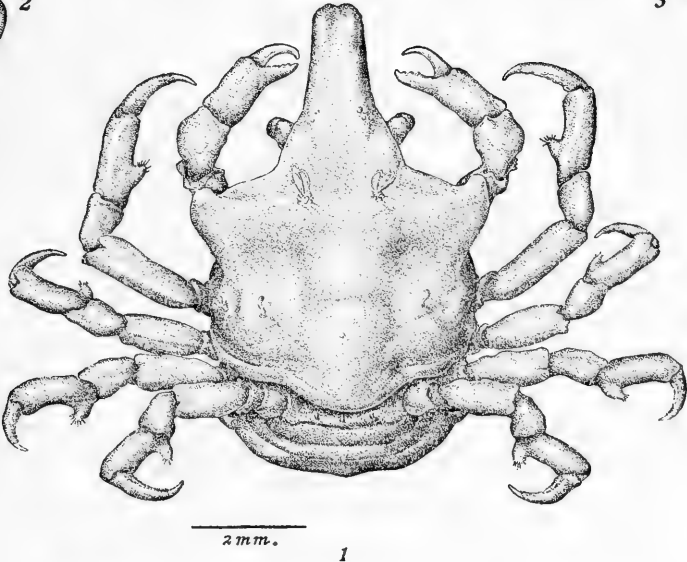
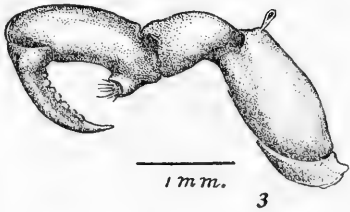
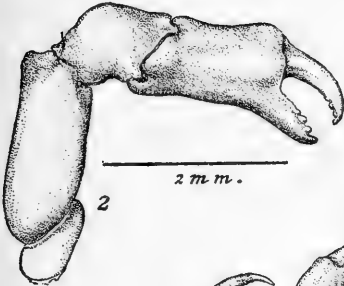




## PLATE 3

*Eupleurodon rathbunae*, new species  
Female holotype

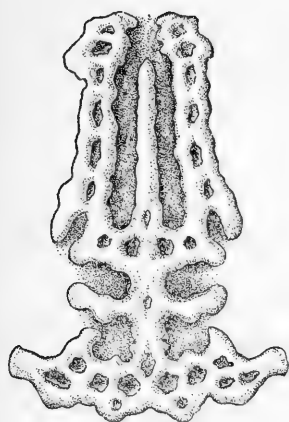
- Fig. 1. Dorsal view
- Fig. 2. Right cheliped
- Fig. 3. Left fourth ambulatory leg
- Fig. 4. Right outer maxilliped
- Fig. 5. Ventral view of front



## PLATE 4

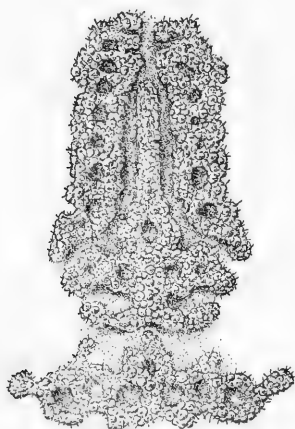
*Glyptoxanthus* species

- Fig. 1. *Glyptoxanthus hancocki*, new species  
Female holotype, dorsal view
- Fig. 2. *Glyptoxanthus labyrinthicus* (Stimpson)  
Gastrocardiac region
- Fig. 3. *Glyptoxanthus meandricus* (Lockington)  
Gastrocardiac region



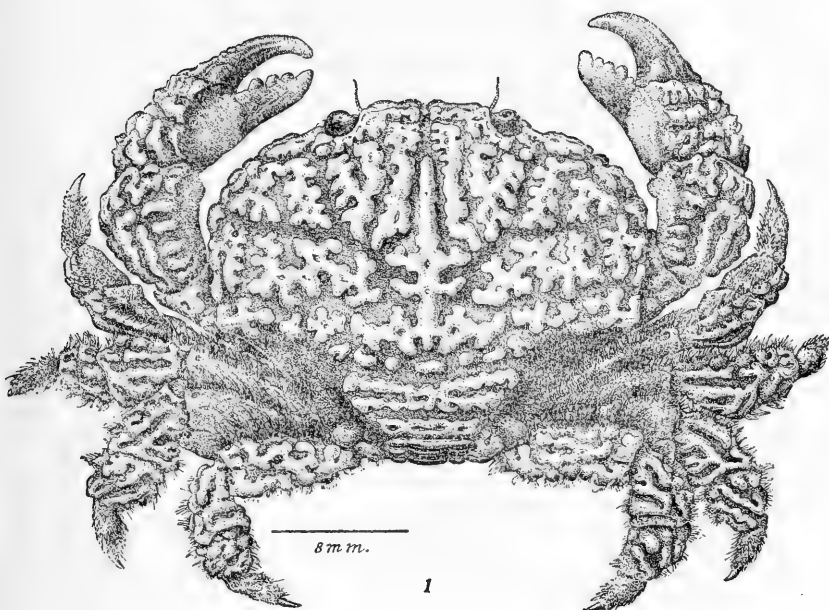
4 m. m.

2



6 m. m.

3



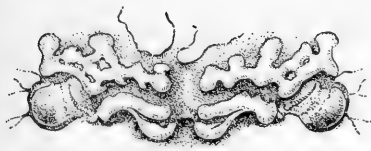
8 m. m.

1

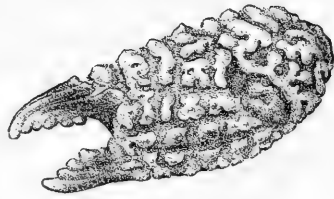
## PLATE 5

*Glyptoxanthus* species

- Fig. 1. Comparative studies of fronts ♂  
a. *Glyptoxanthus hancocki*, new species, allotype  
b. *Glyptoxanthus labyrinthicus* (Stimpson)  
c. *Glyptoxanthus meandricus* (Lockington)
- Fig. 2. Comparative studies of chelae ♂  
a. *Glyptoxanthus hancocki*, new species, allotype  
b. *Glyptoxanthus labyrinthicus* (Stimpson)  
c. *Glyptoxanthus meandricus* (Lockington)
- Fig. 3. Comparative studies of abdomens ♂  
a. *Glyptoxanthus hancocki*, new species, allotype  
b. *Glyptoxanthus labyrinthicus* (Stimpson)  
c. *Glyptoxanthus meandricus* (Lockington)



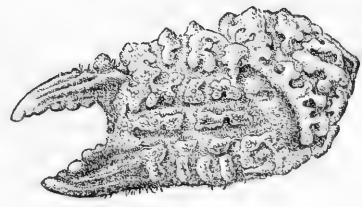
1 a



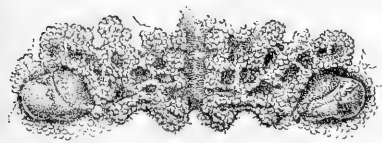
2 a



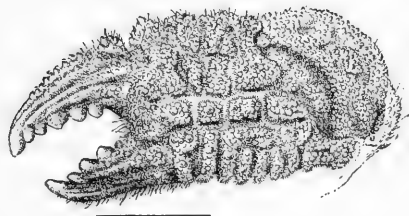
1 b



2 b



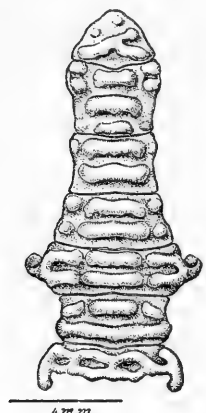
1 c



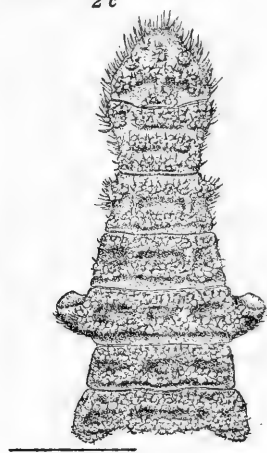
2 c



3 b



3 a



3 c

## PLATE 6

*Hexapanopeus cartagoensis*, new species

Male holotype

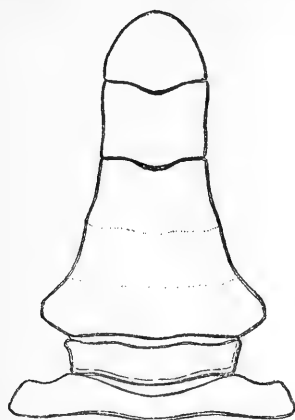
Fig. 1. Dorsal view

Fig. 2. Major chela

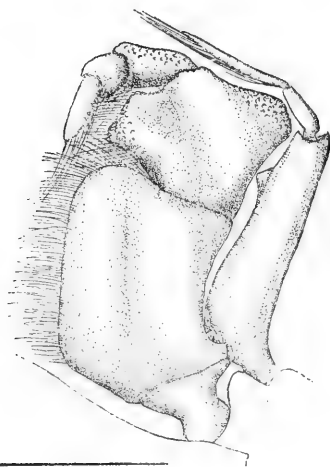
Fig. 3. Abdomen

Fig. 4. Left outer maxilliped



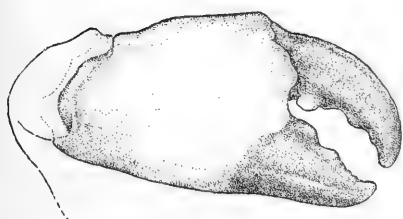


3 1 mm.

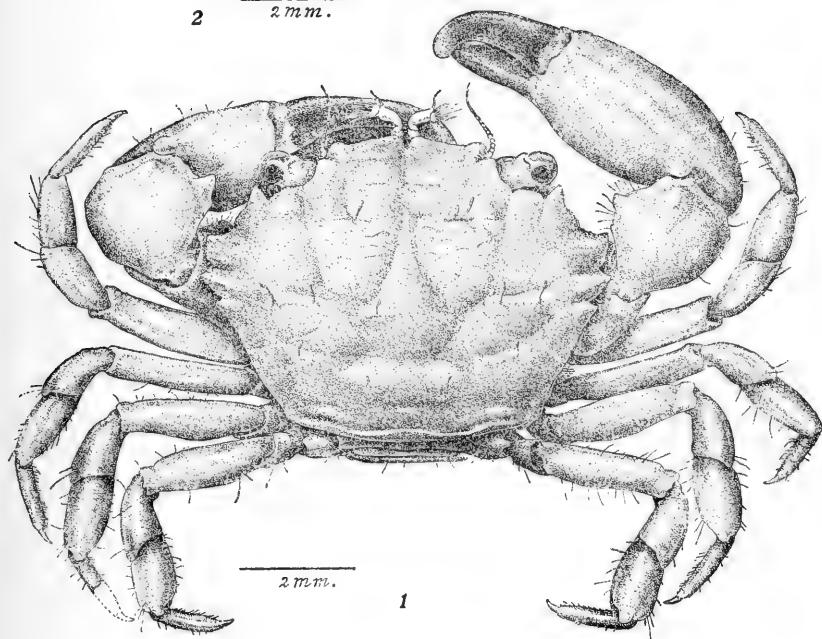


1 mm.

4



2 2 mm.



2 mm.

1

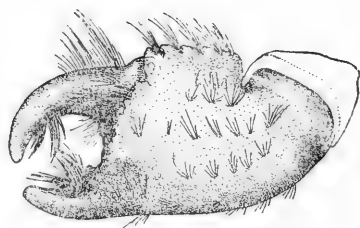
## PLATE 7

*Kraussia americana*, new species  
Male holotype

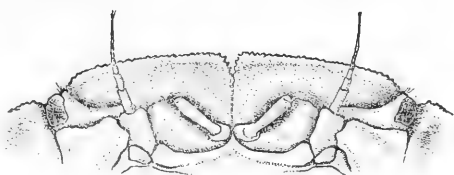
- Fig. 1. Dorsal view
- Fig. 2. Right outer maxilliped
- Fig. 3. Left chela
- Fig. 4. Ventral view of front



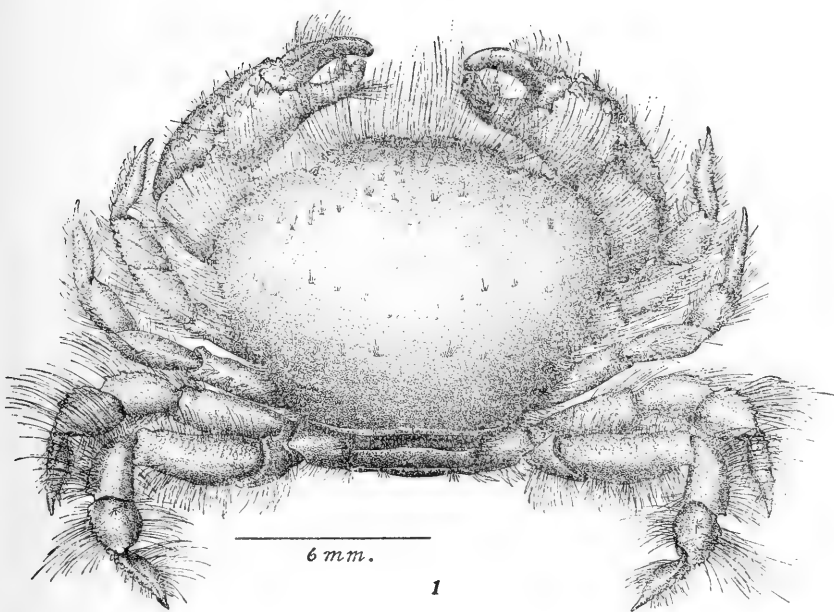
2 2 mm.



3 4 mm.



4 4 mm.



6 mm.

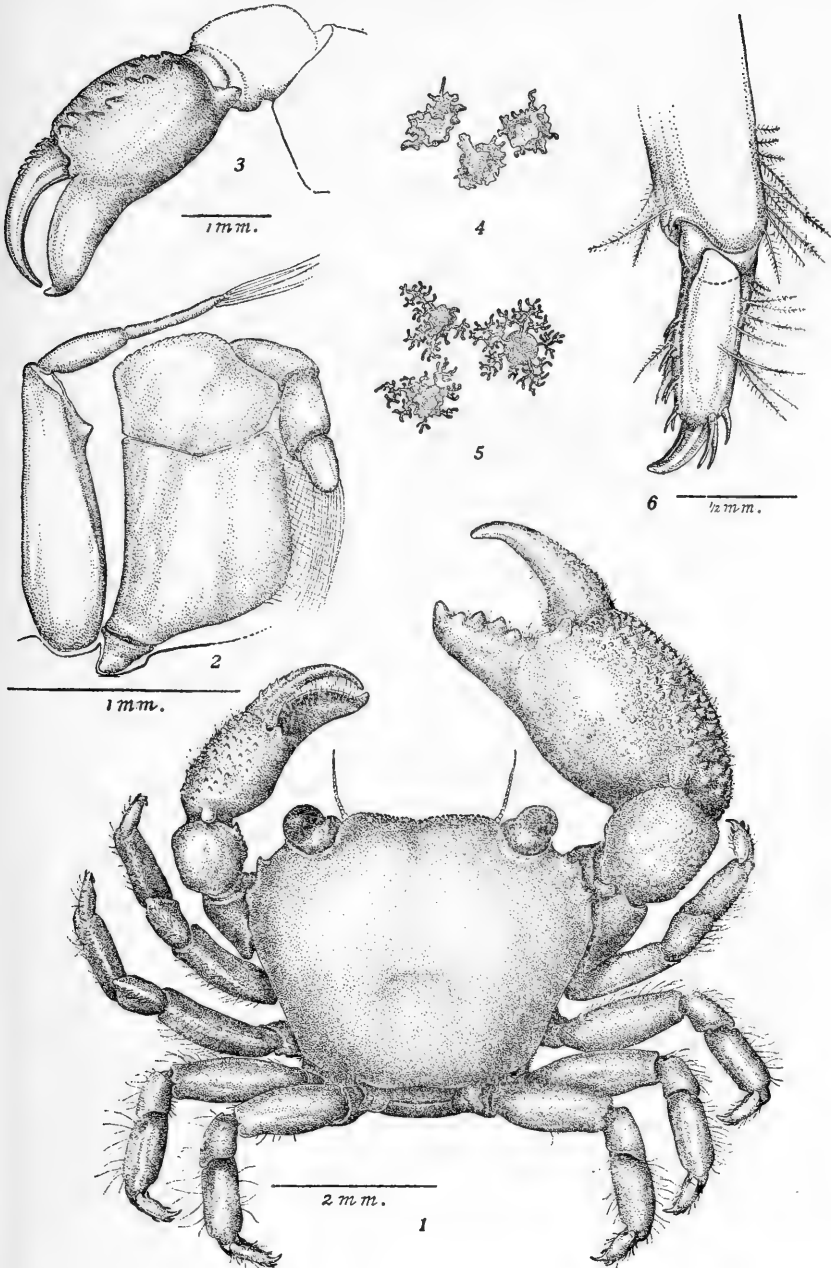
1

## PLATE 8

*Maldivia galapagensis*, new species

Male holotype

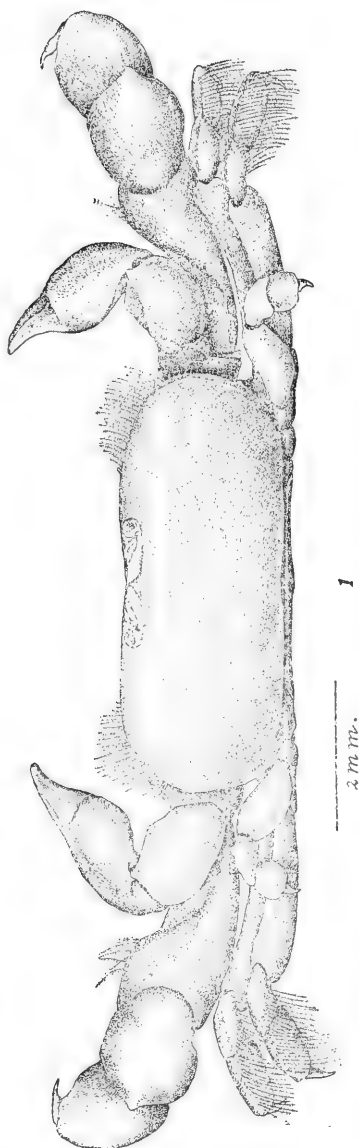
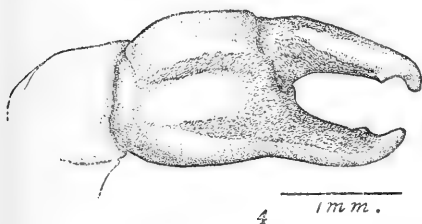
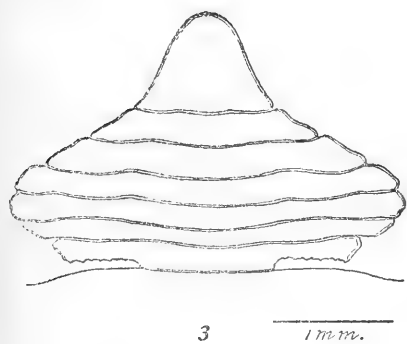
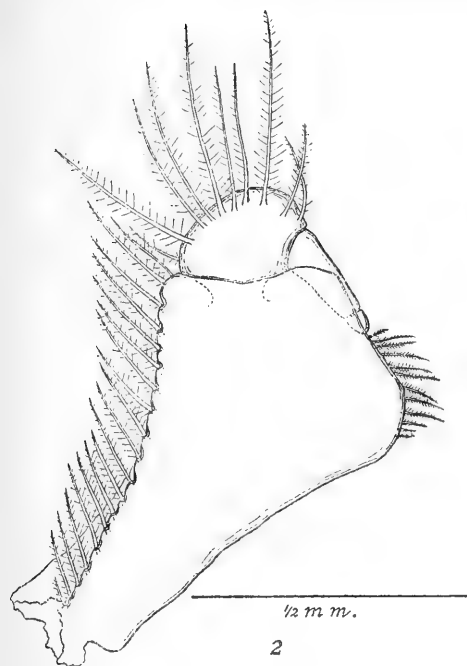
- Fig. 1. Dorsal view
- Fig. 2. Right outer maxilliped
- Fig. 3. Minor chela
- Fig. 4. Chromatophores, anterior portion of carapace
- Fig. 5. Chromatophores, posterior portion of carapace
- Fig. 6. Dactyl of fourth ambulatory leg



## PLATE 9

*Parapinnixa glasselli*, new species  
Female holotype

- Fig. 1. Dorsal view
- Fig. 2. Right outer maxilliped
- Fig. 3. Abdomen
- Fig. 4. Right chela



## PLATE 10

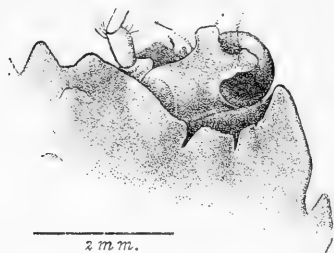
*Cymopolia velerae*, new species  
Female holotype

- Fig. 1. Dorsal view
- Fig. 2. Ventral view of orbit
- Fig. 3. Dorsal view of orbit
- Fig. 4. Right outer maxilliped

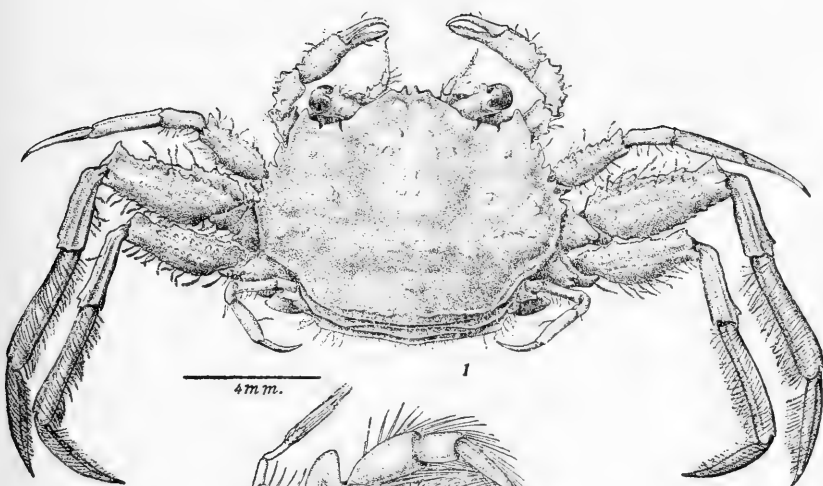




2



3



1



4



REPORTS ON THE COLLECTIONS OBTAINED BY ALLAN HANCOCK PACIFIC EXPEDITIONS OF  
VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA,  
AND GALAPAGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935,  
IN 1936, IN 1937, IN 1938, IN 1939, AND IN 1940.

SOME NEW SPECIES OF BRACHYURAN  
CRABS FROM MEXICO AND THE CENTRAL  
AND SOUTH AMERICAN MAINLAND

(PLATES 11-26)

*By* JOHN S. GARTH

THE UNIVERSITY OF SOUTHERN CALIFORNIA PUBLICATIONS  
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# SOME NEW SPECIES OF BRACHYURAN CRABS FROM MEXICO AND THE CENTRAL AND SOUTH AMERICAN MAINLAND

(PLATES 11-26)

By JOHN S. GARTH

## INTRODUCTORY REMARKS

The present paper resumes the study of the Brachyura collected by the Allan Hancock Expeditions on the Pacific Coast mainland of Mexico, Central America, and South America, from the point reached by Dr. Mary J. Rathbun, whose preliminary descriptions of six new species of oxystomatous crabs from this area appeared in the Proceedings of the Biological Society of Washington, vol. 46, p. 183 (1933), and vol. 48, pp. 1-3 (1935), and whose report on the Oxystomata of the Allan Hancock Expeditions prior to 1935 was incorporated in Bulletin 166 of the U. S. National Museum (1937).

One of the descriptions appearing in the following pages was taken from the unpublished manuscript "A Report of the Brachyura collected on the Hancock Pacific Expedition of 1933 at Stations other than those of the Galapagos Islands," submitted by Mr. Fred C. Ziesenhenné to The University of Southern California in partial fulfillment of the degree Master of Science and is attributed to his authorship. Another is the work of Mr. Steve A. Glassell, who was first to call attention to the dissimilarity between the *Daldorfia* species herein described and *Thyrolambrus erosus* Rathbun.

The accompanying illustrations are from the pen of Mr. Anker Petersen, staff artist of the Allan Hancock Foundation, with the exception of figures 4 and 6 of plate 15, drawn by Miss Jane Roller under the direction of Dr. Waldo L. Schmitt. Color notes were taken from living specimens and are expressed according to Ridgway, "Color Standards and Color Nomenclature" (1912).

Once again the writer acknowledges his indebtedness to Dr. Waldo L. Schmitt for assistance in the field and in the laboratories of the U. S. National Museum, and for the loan of comparative material used in these studies. He is also under obligation to Dr. William Beebe for permission to examine the holotype of *Chasmocarcinus ferrugineus* and

to Mr. Steve A. Glassell for constant advice during the preparation of the manuscript. Last, but not least, he wishes to express grateful appreciation to Captain Allan Hancock for the privilege of traveling eight times to tropical Pacific waters aboard *Velero III*.

## OXYSTOMATA *LEUCOSIIDAE*

Genus **RANDALLIA** Stimpson

***Randallia angelica***, new species

Plate 11, Figs. 1, 2

*Type*: Female, holotype, Cat. No. 361, Allan Hancock Foundation, The University of Southern California, and male, allotype, from north of Angel de la Guardia Island, Gulf of California, Mexico, 40-70 fathoms; March 5, 1936; eight males and eight females, paratypes, same locality and date; collected by Allan Hancock Expedition of 1936 at Velero Station 546-36.

*Measurements*: Female holotype: length of carapace 18.7 mm., width 16.4 mm., length of cheliped 24.2 mm., of chela 12.5 mm., of dactyl 7.2 mm. Male allotype: length of carapace 18.0 mm., width 15.2 mm.

*Diagnosis*: Carapace smooth and bare both dorsally and ventrally; of the cheliped only the merus is conspicuously granulate. Front produced; frontal teeth well separated. Ischium of third maxilliped non-granulate at base. Lower margin of merus of last ambulatory leg without granules.

*Description*: Carapace longer than wide, devoid of pearly granules except on median carina, smooth and bare except under high magnification, when it is seen to be paved with fine, flat granulation. Front produced, its sides forming a distinct, though obtuse, angle with the hepatic margin. Frontal teeth considerably advanced over the exorbital and separated from one another by a positive indentation. Hepatic and pterygostomian regions tumid, tuberculate, posthepatic sulcus barely indicated. Three anterolateral granules, evenly spaced. Five posterior tubercles located as follows: two sharp tubercles on posterior margin, a row of three above it, of which two are postbranchial, the third intestinal. Basal antennular articles all but closing antennular fossae. Outer maxillipeds with a longitudinal row of granules down the middle of the



merus which fades out toward the base of the ischium. Anterior extension of septum of branchial channel trilobate.

Merus of cheliped with conspicuous pearly granules. Carpus and manus smooth and bare to the naked eye, microscopically granulate. Male cheliped one and one-half times the length of carapace. Chelipeds subequal in both sexes.

Sternum and abdomen of female smooth and polished, of male microscopically flat granulate.

Ambulatory legs smooth and bare. Lower margin of merus of fourth walking leg entire.

*Color in alcohol:* This beautiful crab has the same irregular splotching of dark red-orange on cream buff that characterizes *R. ornata* (Randall) (1839).

*Color in life:* Ground color of carapace olive buff almost covered anteriorly with dots of chrome yellow. Large, regular designs vinaceous russet, smaller patches paler and more orange. Posterior spines white. Cheliped yellow to pale buff, merus covered with carrot red, carpus and manus with a coarse netting of the same color. Merus of ambulatory legs pale yellowish white at base blending into intense scarlet on distal portion. Remaining segments yellowish white; dactyl yellow tipped. (Petersen)

*Distribution:* The 30 specimens collected at 5 stations of *Velero III* in the Gulf of California in 1936 and 1937 range from Angel de la Guardia Island to Willard's Point, and it is presumed that the species ranges northward to the mouth of the Colorado River.

*Remarks:* The effectiveness of the thermal barrier to the distribution of species is perhaps not better illustrated than in the case of this crab, which is the Gulf counterpart of the well-known *R. ornata* of the open Pacific. Essentially a cold-water species, *R. ornata* is not known to occur south of Magdalena Bay, while *R. angelica* was not encountered by Allan Hancock Expeditions south of Puerto Refugio, Angel de la Guardia Island, where 13° C. surface temperatures were recorded. Apparently the species do not communicate around Cape San Lucas, where the surface temperature was found to be 20° C. Unfortunately, relative temperatures at depths at which specimens were dredged were not taken.

The points which separate *R. angelica* from *R. ornata* are as follows: (In these comparisons a specimen of *ornata* of like size and sex with the holotype of *angelica* was used.)

- (1) The pearly granules covering carapace, chelipeds, sternum, and abdomen in *ornata* and conspicuous to the naked eye are wanting in *angelica* except on the merus of the cheliped.
- (2) The angle which the more advanced front makes with the hepatic margin in *angelica* is more pronounced than in *ornata*, the frontal teeth are more prominent, and the intervening sulcus is deeper.
- (3) The granules on the external maxilliped tend to disappear toward the base of the ischium in *angelica*, although persisting in *ornata*.
- (4) The lower margin of the merus of the fourth walking leg, denticulate in *ornata*, is smooth and bare in *angelica*.

The species is named for one of the two island guardians of the Gulf's solitude, the Island of the Guardian Angel (Angel de la Guardia) and the Island of the Holy Spirit (Espiritu Santo).

## CALAPPIDAE

Genus **OSACHILA** Stimpson

**Osachila sona**, new species

Plate 12, Figs. 1-4

*Type:* Female, holotype, Cat. No. 387, Allan Hancock Foundation, The University of Southern California, and male, allotype, from Bahia Honda, Panama, 30-50 fathoms; March 1, 1938; four young specimens, paratypes, sex undetermined, same locality and date; collected by Allan Hancock Expedition of 1938 at Velero Station 863-38. Two males and one young female, paratypes, from outside Medidor Island, Bahia Honda, Panama, 30-35 fathoms; March 28, 1939; collected by Allan Hancock Expedition of 1939 at Velero Station 948-39.

*Measurements:* Female holotype: length of carapace 20.0 mm., width 25.5 mm., width of front 6.0 mm., length of chela 9.5 mm., of dactyl 6.0 mm. Male allotype: length of carapace 14.0 mm., width 17.3 mm.

*Diagnosis:* Branchial elevations rounded, extensive, inside of each a small, triangular elevation. Front little advanced, lobes broad. Posterior portion of carapace and ambulatory legs roughly granular. Sternum and abdomen with raised, berried tubercles. Dactyls with paired laminae.

*Description:* Carapace strongly areolate and almost completely coarse granulate, except the spaces between the elevations of the anterior portion, which are bare and microscopically punctate. Branchial elevations extensive, rounded, and tumescent, inside of each a small, triangular areole separated by a deep and naked furrow. Anterolateral margin with sharp denticles grouped in threes, the center of each projecting slightly beyond the others. Posterolateral margins indented in a succession of four steps. Front little advanced, lobes broadened, separated by a shallow depression which communicates with the gastric region posteriorly. Other important areoles located as follows: epigastric, gastric, postbranchial, cardiac, and lateral to the cardiac region. Posterior portion of carapace most conspicuously and irregularly granulate, the granules extending into the depressed areas between the areoles and interspersed with short yellow hairs.

Subhepatic region, external maxilliped, sternum, and abdomen densely granulate. External maxilliped with granules arranged in rows parallel to the long axis of the body, a conspicuous row of punctae separating the two median rows on both ischium and merus.

Abdomen and sternum of both sexes with numerous raised, berried tubercles separated by deeply eroded pits. Terminal segment of female abdomen triangular, sides almost straight.

Tubercles of carpus and manus of cheliped arranged more or less in rows, those of the superior crests sharpened. Granules extending to tips of dactyls. The left cheliped is wanting in the type specimen.

Ambulatory legs with laminate edges denticulate, their superior surfaces paved with rows of granules extending even on the dactyls, the tips of which are amber. Dactyls with paired inferior laminae.

*Color in life:* Carapace cadmium orange with numerous light blotches of madder brown scattered over entire surface. A large patch of madder brown in median groove on gastric area. Eye pale greenish black. Chelae as carapace on outer side, white on inner side. Granules on movable finger madder brown fading gradually toward tip, which is almost white. Fixed finger with a few light touches of cadmium yellow. Ambulatory legs pale cadmium yellow, granules pale madder brown, many of them white. (Petersen)

*Color in alcohol:* The holotype, in spirit nine months at this writing, still shows spots of deep magenta in the depressions surrounding the gastric and epigastric regions.

*Remarks:* This species, closely allied to *O. galapagensis* Rathbun

(1935), differs consistently from the types of the latter (U.S.N.M. No. 69215), in the following features:

- (1) The front is less produced, the lobes wider. [An analogous relationship exists between the smooth-carapace species, *O. lata* Faxon (1893) and *O. levis* Rathbun (1898).]
- (2) The conspicuous branchial elevation is more extensive and appears rounded, instead of angled, when viewed from off center.
- (3) Just inside the branchial elevation there is a small, sharp, triangular prominence cut off by a deep, naked sulcus which occupies an area that in *galapagensis* is depressed.
- (4) Two small, sharp areoles, one just anterior to the lateral angle, the other just posterior, are distinctly separate in *sona*, while joined by a ridge in *galapagensis*.
- (5) The tubercles of the abdomen and granules of the maxilliped are so produced as to all but obscure the rugosities; in *galapagensis* the prominences are reduced to mere ridges outlining the conspicuous indentations. (See pl. 12, figs. 2, 3, and 6.)
- (6) The upper surfaces of the ambulatory legs are heavily granulate, instead of smooth and bare. (See pl. 12, figs. 4 and 5.)

The name *sona*, chosen for its euphony, happens also to be the name of the principal town of the district of Veraguas, situated some miles to the interior of Bahia Honda and referred to by the native population with a strong accent on the final syllable, "*soná*."

## BRACHYGNATHA

### *MAJIDAE*

Genus **PODOCHELA** Stimpson

**Podochela ziesenhennei**, new species

Plate 13, Figs. 1-6

*Type*: Male, holotype, Cat. No. 78780, U.S. National Museum, from Tenacatita Bay, Jalisco, Mexico, 4-10 fathoms; March 18, 1933; female, allotype, same locality, shore; March 18, 1933; collected by Allan Hancock Expedition of 1933 at Velero stations 122-33 and 121-33, respectively.

*Measurements:* Male holotype: length of carapace 11.0 mm., width 7.8 mm., length of cheliped 13.0 mm., of chela 5.4 mm., of dactyl 2.4 mm., of first ambulatory leg 26.0 mm. Female allotype: length 12.9 mm., width 9.0 mm., length of cheliped 12.2 mm., of first ambulatory leg 21.8 mm.

*Diagnosis:* Densely pubescent, posterior portion of carapace flat, margins little projecting laterally. Rostrum thick, bluntly triangular. Basal antennal article relatively wide. Hand of male broad as long, fingers short. First ambulatory leg twice the length of carapace, propodus of leg four sickle shaped.

*Description:* Body and appendages covered with a dense, wooly pile to which foreign matter adheres readily. Carapace narrowly triangular, little or no flare at base of ambulatory legs. Branchial and intestinal regions depressed, giving the posterior portion of the carapace a flat contour broken only by the dome-shaped cardiac prominence. Rostrum thick, bluntly triangular, length and breadth subequal, sides deflexed, two double rows of short, curved setae. Orbits circular, not appreciably thickened, unarmed; a minute postorbital granule. Eystalks broad at base, constricted at base of cornea, which is acuminate medially rather than anteriorly. Neck broad, tumid, and of some length. Hepatic regions projecting but little beyond lateral contour, which makes an almost straight line from cervical suture to postlateral angles. Gastric region high, broad, anteriorly extending on to cervical region, laterally confluent with hepatic regions, posteriorly flattened, surmounted by four groups of curved setae arranged in a rectangle but with no median tubercle. Cardiac elevation small, like gastric nontuberculate, surrounded by depressions which set it off from the branchial and intestinal areas. Branchial regions low, traversed by a longitudinal row of curved setae, sides not produced laterally to cover the insertions of the ambulatory legs.

Antennules folding longitudinally into fossae incompletely divided by the median septum. Antennae visible at sides of rostrum; basal article broader than usual in the genus, traversed by a median ridge more prominent on posterior portion, internal edge slightly laminate; flagellum short, second free segment overreaching rostrum by half its length. External maxilliped with merus longer than broad, sides diverging anteriorly, neither angle appreciably produced, internal margin spinulous. (See pl. 13, fig. 4.) Two low hairy ridges on sternum opposite coxae of chelipeds in place of usual tubercles.

Cheliped of male one and one-sixth times as long as carapace. Merus half as broad as long, ischium half as long as merus, both joints with an inferior hairy border. Carpus without spines but with an inner setose margin. Manus tumid, short and high, superior length and height subequal, outer surface convex, pilose, margins setaceous, inner surface smooth, flattened. Fingers short, hairy, denticulate, meeting with a gape in the proximal two thirds in which one tooth of the dactyl is conspicuous. (See pl. 13, fig. 3.)

Ambulatory legs relatively short and stout as compared to other Pacific species of the genus. First leg twice as long as carapace, dactyl one third as long as propodus. Second, third, and fourth legs decreasing in order. Dactyli of all legs, including first, falcate, inner margins denticulate. Propodus of leg four stout, as strongly curved as the dactylus, and with a basal tuft of hair suggesting a thumb process, against which the dactyl folds. (See pl. 13, fig. 5.)

Cheliped of female slightly less than length of carapace, hand more slender than in the male, fingers longer, almost meeting when closed. First ambulatory leg one and two-thirds times length of carapace.

*Distribution:* The eight specimens in Allan Hancock Foundation collections range from Tenacatita Bay, Jalisco, Mexico, to Salango Island, Ecuador, from shore to eight fathoms.

*Remarks:* This species was at first thought to be *Podocheila angulata* Finnegan (1931) by Mr. Ziesenhenné, who determined the mainland collections of 1933. Later topotypical material from Gorgona Island, Colombia, reveals the following differences:

- (1) The gastric and cardiac regions, while elevate, are not tuberculate.
- (2) The sides of the carapace are not laterally expanded.
- (3) The female chelae, while slender, are not filiform.
- (4) The merus of the outer maxilliped is longer than broad, instead of broader than long.
- (5) The propodus of the fourth walking leg is thicker and more strongly curved.

I take pleasure in naming this distinctive species for Mr. Fred C. Ziesenhenné, companion on six Allan Hancock Expeditions, whose diligence in the collecting of marine invertebrates has resulted in the discovery of more than one species of brachyuran new to science.

Genus **NOTOLOPAS** Stimpson**Notolopas mexicanus**, new species

Plate 14, Figs. 1-4

*Type*: Male, holotype; to be deposited in the U.S. National Museum, from south and west of White Friars, Guerrero, Mexico, 25 fathoms, rock with gorgonids; March 2, 1934; collected by Allan Hancock Expedition of 1934 at Velero Station 264-34.

*Measurements*: Male holotype: length of carapace 7.5 mm., width 5.2 mm., length of cheliped 11.1 mm., of chela 4.2 mm.

*Diagnosis*: Merus of outer maxilliped subtriangular. Rostrum short. Second antennal segment papillate. No posterior carina. Cardiac region high, dome shaped.

*Description*: Carapace subpyriform, convex, and posteriorly rounded. Regions elevate, separated by deep, naked sulci and surmounted by regularly arranged tracts of curved setae. Rostrum short, horns divergent and papillate, each bearing two rows of curved setae, tips incurving. Supraocular spine slender and curving forward; postocular cup broad, exteriorly flattened; a minute tooth between pre- and postocular projections. Four equidistant setose tubercles on carapace, one gastric, two branchial, and one intestinal; cardiac area dome shaped, well separated from branchial swellings. Hairs of carapace restricted anteriorly to well-defined tracts of which the two epigastric are most isolated; posteriorly and laterally the growth of hairs is more diffuse. Intestinal area projecting slightly below the general level of the posterior border; no lamellate posterior carina indicated.

Antennules folding almost longitudinally. Basal antennal article wide, concave, edge thin, a blunt spine at anteroexternal angle, a shallow lobe near base, and a tubercle opposite green-gland opening; first movable segment slender, spinulous, reaching nearly to tip of rostrum and visible in dorsal view; flagellum overreaching rostrum by twice its length. Merus of third maxilliped produced at both internal and external distal angles until almost triangular; ischium with internal margin spinulous. Two compressed lobes on pterygostomian ridge. A pair of deep sternal indentations opposite coxae of chelipeds.

Chelipeds of male stouter than legs, merus and propodus of approximately equal length. Merus with four evenly spaced tubercles along inferior margin, of which the proximal is largest. Manus moderately compressed, fingers gaping slightly at base, regularly toothed, tips crossing.

Ambulatory legs diminishing regularly in length, cylindrical, pubescent; dactyli almost as long as propodi, tips curved.

Sternal trough extending past tip of abdomen, which incompletely fills it.

*Remarks:* The proposed new species is the Pacific analogue of the Atlantic *N. brasiliensis* Miers (1886). Since *N. lamellatus* Stimpson (1871) occurs on both sides of the continent, careful comparison was necessary to ascertain that *N. brasiliensis* does not likewise. Examination of the types of *Hyastenus caribbaeus* Rathbun (1893) (syn. *N. brasiliensis* Miers) Rathbun (1925) shows the following differences:

1. *N. brasiliensis* possesses a long rostrum. This is undoubtedly an age character and might be shown by more mature specimens of the new species.
2. The hepatic region is not tumid on *H. caribbaeus*, although Miers' figure of the type of *N. brasiliensis* shows a tumid region as in the new species.
3. The basal antennal article is thick and bears a prominent lobe on the outer margin. In the new species the edge is thin with but the shallowest of lobes indicated. (See pl. 14, fig. 3.)
4. The merus of the outer maxilliped, squarish in *brasiliensis*, is in *mexicanus* almost triangular. (See pl. 14, fig. 4.)
5. The cardiac region is slightly less protuberant in *brasiliensis*.

In addition to the above, the spongy papillae of the rostrum and second antennal segment appear to be unique in the genus. They may disappear with age.

It should be borne in mind, in connection with the above, that the material available for comparison consisted of the unique holotype of *N. mexicanus*, a young specimen, and the mature types of *H. caribbaeus*. Such great disparity exists between the young and old of this genus, as shown by a long series of *N. lamellatus* in the Hancock collections, that one unfamiliar with the genus might easily mistake the juveniles for a different species, or even refer them to another genus.

The one character constant in individuals of any age should be the shape of the maxilliped. In the case in question, the dissimilarity to *brasiliensis* is sufficient, in the opinion of the writer, to establish the new species on this point alone.



Genus **MITHRAX** LatreilleSubgenus **MITHRAX****Mithrax (Mithrax) clarionensis**, new species

Plate 15, Figs. 1-3

*Type:* Female, holotype, Cat. No. 78777, U.S. National Museum, from Sulphur Bay, Clarion Island, Mexico, 57 fathoms; January 5, 1934; collected at Velero Station 137-34. Female, paratype, Cat. No. 341, Allan Hancock Foundation, The University of Southern California, from the same locality, 15 fathoms; June 11, 1934; collected at Velero Station 305-34 by the Allan Hancock Expedition of summer 1934. Five males and five females (three ovigerous), paratypes, same locality, 28-43 fathoms; March 16, 1939; collected by Allan Hancock Expedition of 1939 at Velero Station 917-39.

*Measurements:* Female holotype: length 12.9 mm., width between fourth lateral spines 12.5 mm., greatest width 12.9 mm., length of cheliped 17.0 mm., of chela 8.0 mm. Largest male paratype: length 10.4 mm., width 10.2 mm.

*Diagnosis:* Width and length of carapace equal. Three spines on basal antennal article, middle spine curving inward. Three denticles on supraorbital margin between pre- and postorbital teeth. Areoles of carapace finely tuberculate. Anterolateral prominences sharply compound tuberculate. Base of hand paved with rounded granules.

*Description:* Carapace ovoid, relatively broad, width as great as length, areolate, the areoles abundantly studded with small, sharp tubercles and finer granules; furrows separating gastric and cardiac from branchial regions smooth and deep. Frontal lobes short, quadridentate, and separated by a U-shaped sinus of equal width and depth. Orbits with three denticles of approximately equal size between the more prominent preorbital and postorbital teeth. Anterolateral margins quadrilobate, the first or hepatic lobe tridentate and pinched off from the rest of the carapace by deep furrows; the second broader, also compound, but confluent with the anterior branchial region basally; the third and fourth single spines surmounted by spinules, between which a subbranchial spine of equal size is clearly visible.

Basal antennal article with two prominent external teeth and a denticle at the base of the first free article; all three visible in dorsal view; middle tooth curving inward at tip. Two prominent inferior orbital teeth, their tips making a broad, concave arc with the two

outer antennal spines. Pterygostomian ridge tuberculate; one suborbital and two subhepatic spines and a paving of subbranchial spinules. Antennules folding almost longitudinally, fossae large, incompletely divided. Merus of third maxilliped deeply notched for insertion of palpus, outer external angle produced and scalloped; inner border of ischium spinulous and hairy.

Cheliped of female with merus and carpus tuberculate and spinulous, merus with an upper row of three or four, an outer row of six, and an inner row of two or three tubercles. Manus with a cluster of half a dozen rounded granules at basal end of superior surface and two or three at base of outer surface; hand otherwise smooth and bare. Fingers of female weak and toothless, meeting with a slight gape.

Ambulatory legs with a double row of spinules above; carpus grooved; propodus cylindrical; dactylus with finely denticulate inner margin, tip yellow, horny, incurving.

*Color in life:* Frontal, gastric, and branchial regions deep hellebore red; cardiac and intestinal regions deep olive buff. A small spot of deep olive buff at base of outer orbital tooth and a large spot at base of first marginal tooth. Chelae deep olive buff; merus with two broad, irregular bands of hellebore red; carpus hellebore red; hands with lighter bands of red and a band at base of fingers; distal half of fingers orange yellow. Ambulatory legs banded as chela. (Petersen)

*Remarks:* Because of its isolated position nearly 500 miles from the mainland coast, Clarion Island, outpost of the Revilla Gigedo group, has developed a unique fauna. A number of morphological characters separate the proposed new species from *M. sinensis* Rathbun (1892) of the Gulf of California, as shown by comparison with a long series of the latter taken by Allan Hancock Expeditions, one of which was compared by the writer with the type (U.S.N.M. 16065).

- (1) The carapace, while but slightly broader than that of *sinensis*, is decidedly wider at the base, the posterolateral margin being more nearly transverse.
- (2) The paving of the carapace is composed of much finer tubercles and granules, there being approximately twice as many raised prominences on any area examined. (See comparative gastric regions, pl. 15, figs. 1 and 5.)
- (3) There is a fully developed third orbital spine, as against two mentioned in the description of *sinensis* and the merest sug-

gestion of a third, found by Dr. Waldo L. Schmitt and shown by a figure of the type. (See pl. 15, figs. 3 and 6.)

- (4) The middle of the three basal antennal spines is attenuated and incurving instead of short and blunt. (See pl. 15, figs. 2 and 4.)
- (5) Both the infraorbital spines are as prominent as the outer antennal. In *sinensis* one or both are reduced. (See pl. 15, figs. 2 and 4.)
- (6) The female chela is paved proximally with rounded granules instead of being entirely smooth and bare.

### Genus **MACROCOELOMA** Miers

#### **Macrocoeloma maccullochae**, new species

Plate 16, Figs. 1-4

*Type*: Male, holotype, Cat. No. 372, Allan Hancock Foundation, The University of Southern California, from Isabel Island, Mexico, 10-18 fathoms; April 2, 1937; collected by Allan Hancock Expedition of 1937 at Velero Station 747-37. Two males, two females, and one young, paratypes, same locality, 10-15 fathoms; March 8, 1938; collected by Allan Hancock Expedition of 1938 at Velero Station 870-38.

*Measurements*: Male holotype: length of carapace including rostral spines 31.3 mm., branchial width including lateral spines 20.0 mm., excluding lateral spines 17.0 mm., width at level of preorbital spines 10.6 mm., at level of hepatic region 9.9 mm., length of rostrum 9.2 mm., of cheliped 35.8 mm., of hand 15.2 mm.

*Diagnosis*: Rostral horns cylindrical and contiguous almost to tips. Postlateral spines acute, cylindrical, directed obliquely backward and upward. Four tuberculate dorsal bosses arranged in a diamond. A boss or tubercle anterior to the posterior median spine. Basal antennal spine directed obliquely outward. Cheliped of male one and one-sixth times length of carapace including rostrum.

*Description*: Carapace distended, subpyriform, broadened anteriorly at the orbital level and covered with a dense, wooly pile interspersed with longer, yellow, hooked hairs. Gastric, cardiac, and branchial regions swollen, each surmounted by a large boss or tubercle, the four forming a perfect diamond. Carapace constricted at the hepatic level; two small epigastric tubercles. Two strong, cylindrical, acuminate postlateral spines, directed obliquely outward, backward, and upward, the

right wanting in the holotype specimen. A smaller spine on the posterior border at the mid-point, in front of it a boss or tubercle at the intestinal level. A total of eight major prominences, with the two epigastric, ten. Rostral spines long, cylindrical, tapering, not flattened, contiguous from bases almost to tips, which are sharply divergent, except in young specimens; length of rostrum about four-fifths times the distance between the preorbital spines. Orbits tubular, protruding beyond margins of carapace, postorbital extending beyond preorbital, their tips making a straight line with the tip of the antennal spine when seen in dorsal view. Upper orbital margin deeply incised, spines separated by a fissure fused distally but open proximally and extending on to the hepatic region.

Basal antennal article broad, bearing an obliquely directed spine. Flagellum long, reaching four fifths the length of the rostrum, its first two movable segments appreciably thickened. A tubercle at the level of the green-gland opening; a similar pterygostomial tubercle. Merus of third maxilliped irregular in outline, anterointernal angle sharply produced, anteroexternal angle broadly lobate, merus inserting at a point considerably below the distal extremity of the ischium.

First ambulatory leg much the longest in the male, the remaining legs gradually diminishing; those of the female rather short; legs cylindrical, pubescent, somewhat nodose. Carpus slightly inflated and grooved superiorly; dactylus with lower border spinulose, tip yellow and incurving.

*Distribution:* In addition to the type series from Isabel Island, Mexico, a female specimen was dredged by *Velero III* at Playa Blanca, Costa Rica, and a young male at La Libertad, Ecuador.

*Remarks:* The proposed species is the Pacific counterpart of *M. trispinosum* (Latreille) (1825), from which it may be separated by the following features:

- (1) The rostral horns are long, cylindrical, and contiguous throughout the greater part of their length, instead of short, flattened, and diverging almost from their bases.
- (2) The preorbital spine is directed obliquely forward instead of transversely.
- (3) The first two movable segments of the antenna are coarse instead of slender.
- (4) The postlateral spines are more backward than sideward pointing.

- (5) There are two tubercles, or a tubercle and a boss, on the median line just above the posterior margin instead of a single tubercle.
- (6) The male cheliped is considerably longer than the carapace, including the long rostrum, instead of the same length, its merus reaching the middle of the rostrum instead of the level of the postorbital spine.
- (7) The merus of the third maxilliped is irregular in outline, produced on either side of the maxillary palp, and inserting deeply on the outer border of the ischium, instead of squarish in outline with a moderate notch for the palp and an insertion near the distal end of the ischium. (See pl. 16, fig. 3.)
- (8) The male copulatory appendages have bifurcate curled tips instead of single, lunate tips. (See pl. 16, figs. 2 and 5.)

Judging from the great variability in the Atlantic species, which has been separated into three named varieties, it is remarkable that the eight specimens of *M. maccullochae* at hand conform as remarkably as they do in these important characters. In none of them do the lateral spines tend to take on a bladelike appearance, the rostral horns to broaden and flatten, or the constriction beneath the orbits to disappear as in *M. trispinosum nodipes* (Desbonne) (1867). A larger series might, however, exhibit greater diversity.

The holotype specimen was covered with a soft sponge which has been identified by Mr. Malcolm G. Dickinson as *Hymeniacidon synapium*.

I take pleasure in naming this striking species for Dr. Irene A. McCulloch, professor of zoology of The University of Southern California, who first encouraged me in the study of marine animals.

## *PARTHENOPIDAE*

Genus *DALDORFIA* Rathbun

*Daldorfia garthi* Glassell, new species

Plate 17, Figs. 1-11

*Parthenope (Pseudolambrus) excavata* (Stimpson), Boone, Zoologica, N. Y. Zool. Soc., vol. 8, no. 4, 1927, p. 173, text fig. 58.

*Type:* Male, holotype, Cat. No. 3811, Allan Hancock Foundation, The University of Southern California, from Sullivan Bay, James Island,

Galapagos, shore; January 21, 1938; collected by Allan Hancock Expedition of 1938 at Station 796-38. Female, paratype, ovigerous, Cat. No. 3811a, Allan Hancock Foundation, collected at same place and time. The remaining paratypes are considered under the heading *Material examined*.

*Measurements:* Male holotype: length of carapace 31 mm., width 47 mm., length of merus (major cheliped) 29 mm., carpus 13 mm., manus including pollex 46 mm., width at base of dactyl 20 mm., height of sternal pit 3.8 mm., breadth 5 mm. Female paratype: length of carapace 30 mm., width 45 mm., length of merus (major cheliped) 23 mm., carpus 12.0 mm., manus including pollex 27 mm., width at base of dactyl 16.5 mm.

*Diagnosis:* Carapace subtriangular, lateral regions deeply eroded and spined on the anterolateral and posterolateral margins. Posterolateral and posterior margin nearly a straight line. Basal antennal article almost reaches the orbital hiatus. Sternal pit semiovoid. Chelipeds heavy, short, unequal. Meri of ambulatory legs one and one-half times as long as wide, with teeth of upper crest having a tendency to overlap, leaving interstices between; propodi about as wide as long with two teeth on lower margin; dactyli longer than their propodi, granulated except for corneous tip.

*Description:* Carapace subtriangular, about five eighths as long as wide, rostrum bluntly rounded and deflexed. Protogastric regions high, with a median eroded sulcus, mesogastric region less in height, semi-conical posteriorly, and margined posteriorly with a wide deep pit on each side. The ridge joining the frontal regions with the branchials has two closed sutures. Cardiac region depressed, outlined with erosions and mushroomlike tubercles. Outer and submarginal posterior border eroded, with an eroded, depressed tooth on each side of the first abdominal segment. The hepatic region is obliquely vertical, projecting downward in a broadly triangular lobe. Anterolateral margin bordered with eleven or twelve granulated, serrate-edged teeth, each with a median ridge, those on the posterior half the largest. The posterolateral margins are tangent to the anterolateral, with teeth similar to those of the latter except that the edges are interlaced and coalesced forming a subentire line.

The chelipeds are about twice the length of the carapace; merus roughly trigonous, three quarters the length of the carapace, depressed on upper surface which is punctate and lobed, the inner margin with three or four granulate lobes, the outer proximal margin with three or

four eroded spines as on the carapace, a small median lobe and a larger subdistal one with granulated top; carpus with two or three inner marginal lobes, the outer surface with lumpy granulate-tipped bumps; manus subequal in length to that of carapace, triangular in cross section, with three large lobes on upper, inner margin, the median the largest and projecting over the inner side of palm, distal upper end of hand raised and lumpy with granules, outer surface of palm with four longitudinal rows of granulous lobes, the upper two rows the largest, the first or top row with three lobes on the proximal half, the second row with four or five, the largest near the gape, the remaining rows are much smaller and extend onto the pollex. The pollex on the major hand is deflexed, short, stout, and with a subbifid tip, unarmed, the inner edge forming a right angle in the gape; the dactyl is granulous, slightly curved and armed with three inner lobes, the proximal the largest; fingers widely gaping; the pollex of the minor hand is subhorizontal, tuberculate on the outer surface, subtriangular from base to apex, the cutting edge sharp and armed with denticles; the dactyl is nearly straight on prehensile margin, an upper proximal granulous lobe, the outer surface tuberculous and eroded, the fingers not gaping.

Basal antennal article not quite reaching the ocular hiatus. Outer maxillipeds eroded and tuberculate, with longitudinal sulci, the distal anterior margin of the merus produced. Sternal pit semioval in male, the abdomen not intruding; in female it is more circular, is a continuation of the sternal trench, and is entered by the bent tip of the abdomen. The sternum, like the ischium of all of the legs, is eroded and granulate. The abdomen in both sexes is seven jointed, deeply eroded with a regular pattern; in the male the third segment is widest, the sixth the longest.

Ambulatory legs with meri compressed, nearly three fourths as wide as long, the teeth on the upper crest partly overlapping one another, leaving interstices between, the lower surface excavate between the side margins, which like the upper crest is pierced with small holes, the margins sutured; the carpus has a high narrow crest; the propodus two projections on its posterior margin; the dactyli are slightly curved and granulous up to the corneous tip.

*Variation:* Considerable variation is found between the adults and the juveniles, the latter being much flatter, the depressions shallower, the surface more eroded and reticulated, the entire upper surface in the merus of the chelipeds deeply eroded, the tip of the male abdomen touching the proximal margin of the sternal pit, instead of being removed from

it as in the adult. This difference between the surface structure of juveniles and adults accounts for the peculiar features of the latter. As an example, the merus of the chelipeds in the smaller specimens is heavily eroded, and these same surfaces in larger specimens have the appearance of scar tissue.

*Range:* From Cape San Lucas, Baja California, Mexico, to Colombia, and the Galapagos Islands.

*Material examined:* Octavia Bay, Colombia, January 28, 1935, shore; one female. Secas Islands, Panama, January 29, 1935, shore; two juvenile males. Bahia Honda, Panama, March 10, 1933, two fathoms; one male, juvenile. Playa Blanca, Costa Rica, February 8, 1935, shore; three adult males, three juvenile males, and one juvenile female. Sullivan Bay, James Island, Galapagos (see *Type*), also from same location, December 13, 1935, shore; one adult male. Charles Island, Galapagos, December 5, 1934, shore; one adult female. All the above specimens were collected by the Allan Hancock Expeditions of the various years mentioned.

Off the Nicaraguan Coast, lat.  $12^{\circ} 48' N.$ , long.  $87^{\circ} 06' W.$ , February 3, 1939, twelve fathoms; one adult male; collected by Captain Fred E. Lewis on the yacht *Stranger*.

Cape San Lucas, Baja California, Mexico, shore; February 1, 1938; one adult male; collected by the author.

*Habitat:* From the lower tidal regions, among rocks, to a depth of twelve fathoms.

*Remarks:* This proposed species has an affinity for *D. semicircularis* (Flipse), 1930, but differs from that species in that the dorsal edges of the meri of the ambulatory legs are overlapping instead of being more or less entire. I have not seen a specimen of *D. semicircularis*, but through the kindness of Dr. Edmondson and Dr. Bryan of the Bishop Museum, Hawaii, I examined two specimens of *D. horrida* (Linn.) from that location, and this proposed species differs from *D. horrida* in that the sternal pit is semioval instead of broadly triangular, the posterolateral margins forming a straight line with the posterior margin instead of being oblique to this margin. To Dr. Fenner A. Chace, of M.C.Z., I am indebted for comparisons and literature.

This species is named for Mr. John S. Garth of the Allan Hancock Foundation, in appreciation of his having allowed me to describe this species and to examine the materials at his disposal.

The accompanying drawings are not of the holotype.



Genus **HETEROCRYPTA** Stimpson**Heterocrypta colombiana**, new species

Plate 18, Figs. 1-2

*Type*: Male, holotype, Cat. No. 78778, U.S. National Museum, from Port Utria, Choco, Colombia, shore; February 15, 1934; collected by Allan Hancock Expedition of 1934 at Velero Station 239a-34. Female, allotype, Cat. No. 351, Allan Hancock Foundation, The University of Southern California, from Salinas Bay, Costa Rica,  $1\frac{1}{2}$  fathoms; February 11, 1935; collected by Allan Hancock Expedition of 1935 at Velero Station 478-35.

*Measurements*: Male holotype: length of carapace 4.9 mm., width 7.0 mm., length of major chela 4.5 mm., of major dactyl 1.8 mm., height of gape 0.8 mm. Female allotype: length 4.5 mm., width 6.7 mm.

*Diagnosis*: Posterior margin of carapace almost straight, a well-defined angle at branchial ridge. Merus of fourth walking legs concealed in dorsal view. Rostrum elongate, faintly trilobate. Major chela half as high as long, fingers widely gaping.

*Description*: Carapace depressed, width nearly one and one-half times length, smooth and microscopically punctate. Branchial ridge paralleling the anterolateral border, although more nearly straight, and consisting of a double row of beaded granules. A short, transverse gastric ridge joining the branchial ridges, the carapace highest at their point of union. From this prominence a faint single line of granules extends half way to the orbit. Cardiac region low and nongranulate, although the punctae appear larger on this area. Posterior margin between branchial ridges almost straight, hiding the merus of the fourth walking legs from dorsal view but leaving the basal abdominal segment visible; a pronounced angle at its lateral extension beyond the branchial ridge. Rostrum broadly elongate, margin granulate, faintly trilobate. Orbit with a closed fissure above.

Under surface of carapace covered with beadlike granules except beneath lateral and posterior margins. Under side of rostrum excavate, antennules folding acutely, almost parallel to one another. Basal antennal article minute, the short flagellum not excluded from the orbit and lodged at the side of a prominent suborbital tooth, which is separated from the exorbital prominence by a deep and relatively wide fissure. External maxilliped completely granular, merus notched at inner angle for insertion of palpus and produced at the external angle so that

its outer border makes a broadly concave arc with the outer border of the ischium. A granular ridge runs from the anteroexternal angle of the buccal cavity to the base of the cheliped.

Chelipeds short, heavy, and strikingly disproportionate; the merus of each widest at its mid-point, with two serrate denticles on its inner margin and a clear row of beaded tubercles running the length of its inferior surface; carpus of each with a continuation of this granular ridge on the under side and three additional lines of granules on the superior surface; manus of the large claw with a high superior crest faintly angled at its mid-point, a median crest on the inner surface of the palm more sharply angled, and an outer row of bead granules similar to those on the carpus and merus; manus widening distally, greatest height one-half times the length; dactyl strongly curving downward, provided with spinulous ridges, and meeting pollex with a wide gape; immovable finger curving slightly upward, not constricted at base. Minor chela with a single tooth at mid-point of superior crest, widening little distally, its lower margin straight; fingers closing without a gape, tips crossing.

Segments 3-5 of male abdomen fused; abdomen narrowest at base of sixth segment, seventh segment triangular.

*Color in alcohol:* The specimen still retains a purplish-brown area embracing the rostrum and the anterior portion of the carapace. Against this background a light line runs inward from the base of each denticle of the lateral margins.

*Remarks:* This species is the Pacific analogue of *Heterocrypta granulata* (Gibbes) (1849), from which it may be distinguished by the straighter posterior margin concealing the fourth pair of walking legs and the consequently more evident angle of the posterior margin at the branchial ridge. It also differs from *granulata* by the depressed, non-granulate cardiac region, the more elongate front, the more prominent serrate teeth on the merus and manus of the cheliped, the greater height of the large claw in proportion to its length, and the upturned, rather than deflexed, immovable fingers. The lateral and posterior protuberances of the sixth abdominal segment of the male in *granulata* are wanting.

The discovery of this short-armed species at Port Utria, Colombia, fills a gap in the genus as represented in the Pacific. The other species, *Heterocrypta macrobrachia* Stimpson (1871) and *H. occidentalis* (Dana) (1854), are both long-armed species. The new species is more

likely to be confused with *Cryptopodia hassleri* Rathbun (1925), the chelae of which, however, are subequal and the laminate margins of which extend far beyond the walking legs.

## **PORTUNIDAE**

Genus **PORTUNUS** Weber

Subgenus **PORTUNUS**

**Portunus (Portunus) acuminatus** Stimpson

Plate 19, Figs. 1-3

*Achelous acuminatus* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 10, 1871, p. 112[22] (type locality, Panama; type not extant;) not *Portunus (Portunus) acuminatus* Rathbun, Proc. U. S. Nat. Mus., vol. 38, 1910, pp. 538 and 577, pl. 49, fig. 4; not *Portunus (Portunus) acuminatus* Rathbun, Bull. 152, U. S. Nat. Mus., 1930, p. 56, pl. 19.

*Type*: Male, neotype, Cat. No. 391, Allan Hancock Foundation, The University of Southern California, from Port Parker, Costa Rica, 5-10 fathoms; March 25, 1939; collected by Allan Hancock Expedition of 1939 at Velero Station 936-39.

*Measurements*: Male neotype: length of carapace 13.0 mm., width including lateral spines 32.3 mm., length of lateral spine 5.8 mm., of cheliped 42.0 mm., of chela 20.4 mm., of dactyl 9.4 mm., height of manus at base of spine 2.6 mm.

*Color in life*: Ground color of carapace ivory yellow overcast with patches of light buffy brown, which take regular shape on gastric, cardiac, and intestinal regions. All ridges and spines garnet brown, a spot of the same color on cardiac, intestinal, and postbranchial areas. Chela as carapace with bands of garnet brown on carpus, manus, and outer surface of movable finger. Inner surface of movable finger and fixed finger bright, mallow purple; tips light brown. Ambulatory legs like carapace but lighter, banded with garnet brown. Dactyl vermilion with tinge of blue. Ventral side light buff; eggs scarlet. (Petersen)

*Distribution*: The 165 specimens from 16 Velero stations range from Isabel Island, Mexico, to La Libertad, Ecuador, including the original type locality, Bay of Panama.

*Remarks*: A consideration of the several thousand specimens of *Portunus* in the collections of the Allan Hancock Expeditions revealed the presence of a distinctive species in relative abundance which could not be

placed according to the classification proposed by Rathbun (1930), in which *Portunus (P.) acuminatus* Stimpson is considered a member of the so-called "*acuminatus-asper-panamensis* group." Reference to the original description of *Achelous acuminatus* Stimpson (1871) confirmed suspicion that the abundant species mentioned above was the real *acuminatus* rather than the photographed specimen (40270) upon which Miss Rathbun based her revised description in the Cancroid volume and her concept of *acuminatus*, *asper*, and *panamensis* as possible forms of a single species.

Especially significant is the fact that the real *acuminatus* is a small species, the males rarely attaining a size larger than that described by Stimpson (0.5 x 1.26 inches), while Miss Rathbun's *acuminatus*, although twice the size (1.0 x 2.5 inches), is considered by her as immature.

Particulars in which the species under consideration compares better with Stimpson's *acuminatus* than does the male specimen 40270 are as follows:

- (1) The length of the chelipeds of a male specimen of like dimensions with Stimpson's type, no longer extant, is exactly three times the carapace length instead of two and one half.
- (2) The length of the lateral spine is all of two-thirds times the length of the anterolateral margin instead of one half. This length increases proportionately rather than decreases as the specimens approach the size of Miss Rathbun's.
- (3) The length of the merus of the cheliped is greater than the length of the carapace, as described by Stimpson, instead of less in specimen 40270.
- (4) The manus is very slender instead of scarcely less slender than that of *panamensis* or *asper*.
- (5) The carpus of the cheliped is thin in conformity to the slender manus.

(In connection with the carpus and manus, it seems well to point out that the thickness of the hand may refer either to its width, as seen in dorsal view, or to its height, as seen in frontal view. Not only is the chela of the true *acuminatus* very slender from above, but its proportionate height to length is 1:7 instead of 1:3.5 in the Rathbun specimen.)

- (6) The second, fourth, and sixth anterolateral teeth are appreciably reduced instead of "only the second and sixth showing any

reduction" (Rathbun), a condition suggestive of the almost un-reduced teeth of *Portunus* (*P.*) *asper*.

- (7) The frontal teeth are equal and bluntly triangular instead of the outer pair being less triangular than the inner.

There is no particular in the Stimpson description not met in full by the species in question, which is as distinct from *panamensis* as both are from *asper*. One might desire that Stimpson had expatiated upon the extreme fragility of the carpus and manus, yet the words "very slender" convey the meaning now that additional specimens are at hand. Also, the extreme attenuation of the lateral spine, encompassing all but one, or in rare cases, all the lateral spines except the exorbital, might have been more forcibly called to attention. This was indicated by Stimpson in the designation *acuminatus*, but the meaning of the name perished with his specimen, to be recovered with ours.

In an attempt to account for the Stimpson species, Miss Rathbun has successively applied the name *acuminatus* to the most likely specimens among the meager assortment of Pacific *Portunus* at her disposal. Her *Portunus* (*P.*) *acuminatus* (1910) from Sechura Bay, Peru, was later referred by her to *P. panamensis* (1930) in the light of the above-mentioned specimen 40270, which, while not in complete agreement, as noted by her, fitted the description better than the Peruvian specimens. The writer follows the same logic in abandoning her specimen 40270 as *acuminatus* in consideration of the large series of Hancock Expedition specimens which fit Stimpson's description precisely. One of these, a male of identical dimensions, has been selected to replace Stimpson's type, which perished in one of a series of disasters which decimated his collections.

A key to the identity of the Rathbun specimen is found in the fact that on the strength of it she considered *acuminatus*, *panamensis*, and *asper* as possible forms of a single species. Its measurements preclude the possibility of its being the relatively narrow *panamensis*; hence it is probably an *asper*, the lateral spine of which has the maximum attenuation. Similar specimens are found in the Hancock collections, usually coming from south of Panama rather than north, the lateral spines of which are as long as the width of the five adjacent teeth. The writer was unable to locate the Rathbun specimen at the National Museum and has since learned that its misplacement was the result of a simple switch with *P. ordwayi* at the time the specimens were removed from their containers to be photographed.

Re-establishment of Stimpson's *P. acuminatus* gives equal and specific rank to the three organisms, *asper* (= *transversus* Stimpson), *panamensis*, and *acuminatus*, as conceived by Stimpson, rather than as forms of a single species, as suggested by Rathbun. Diagnostic characters are as follows:

- (1) *P. asper*: Anterolateral arc broad, teeth showing little reduction; lateral spine equal to width of 4 or 5 adjacent teeth; cheliped heavy,  $2\frac{1}{3}$  times carapace length.
- (2) *P. panamensis*: Anterolateral arc narrow (*Achelous*-like), teeth 2, 4, and 6 showing reduction; lateral spine equal to width of  $2\frac{1}{2}$  to 3 adjacent teeth; cheliped heavy, 3 times carapace length in male,  $2\frac{1}{2}$  in female.
- (3) *P. acuminatus*: Anterolateral arc broader than *panamensis*, though not as broad as *asper*, teeth 2, 4, and 6 showing reduction; lateral spine equal to width of 6 or 7 adjacent teeth; cheliped fragile, length 3 to  $3\frac{1}{2}$  times carapace in male, height of manus  $\frac{1}{6}$  or  $\frac{1}{7}$  times length of chela.

## XANTHIDAE

Genus **PLATYXANTHUS** A. Milne Edwards

**Platyxanthus balboai**, new species

Plate 20, Figs. 1-8

*Type*: Female, holotype, Cat. No. 392, Allan Hancock Foundation, The University of Southern California, and male, allotype, from outside Medidor Island, Bahia Honda, Panama, 30-35 fathoms, rock, mud, and dead coralline; March 28, 1939; collected by Allan Hancock Expedition of 1939 at Velero Station 948-39.

*Measurements*: Female holotype: length of carapace 26.8 mm., width 30.8 mm. Male allotype: length of carapace 31 mm., width 36 mm., of fronto-orbit 9.5 mm., of front 4.6 mm., length of major cheliped 60 mm., of chela 49 mm., of dactyl 22 mm., height of manus 19 mm., of gape 4.7 mm.

*Diagnosis*: Carapace narrow, convex, lumpy, proportion of length to breadth 6:7. Front advanced, quadrifid, well separated from orbit, frontal teeth tuberculiform. Four anterolateral teeth beside the exorbital. Merus of outer maxilliped longer than broad, pentagonal; ischium deeply furrowed. Chelipeds of male grossly disproportionate, major chela approaching half of carapace displacement. Epistome and antennular areas

deeply sunken beneath front. Tips of male copulatory appendages visible at sides of abdomen.

*Description:* Carapace superficially smooth and bare, microscopically flat granulate, uneven, narrow, breadth exceeding length by one sixth, very convex longitudinally as well as transversely, regions incompletely indicated. Front advanced, quadridentate, teeth subequal, tuberculiform, granulate, hairy, well separated; median V deep, prolonged posteriorly into a gutter, lateral separations U-shaped and of one half the depth. Orbits directed forward, inner orbital tooth triangular, almost as advanced as the front, as thick at base as half the front, and separated from it by a deep U-sinus also prolonged into a groove; three orbital fissures, two dorsal and one ventral, separating three equal and inconspicuous teeth, the median, exorbital, and outer suborbital; inner suborbital tooth prominent, visible in dorsal view at side of inner orbital, and separated from it by a wide hiatus. Eye deeply retractile, base standing in orbital hiatus, a row of granules bordering cornea. Anterolateral teeth four, exclusive of the minute exorbital, the first bluntly triangular, separated from the exorbital by a broad, swollen margin equal in width to the next two teeth, second and third teeth tuberculiform, crowded toward first, fourth tooth again separated from third by a sinus as broad as the distance between the first tooth and the exorbital; carapace widest at level of fourth tooth; a subhepatic tubercle barely concealed in dorsal view. Furrows of carapace incompletely defining the somewhat protuberant protogastric, hepatic, and epibranchial regions.

Epistome wide, deeply sunken beneath front. Antennules folding obliquely between inner and outer pair of frontal teeth. Antenna with basal article falling far short of rostrum, flagellum occupying normally the U-shaped sinus between front and orbit, rather than the orbital hiatus. (See pl. 20, fig. 2.) Merus of external maxilliped pentagonal, apex directed forward, length a shade greater than breadth, granulate and hairy. Ischium with a furrow parallel to the margin at inner two fifths superficially as definite as the separation between endognath and exognath. (See pl. 20, fig. 6.) Sternum of male with two raised, granulate areas opposite coxae of chelipeds.

Male abdomen with seven free segments, terminal joint broader than long, its sides converging, sinuous, tip pointed. Abdomen when in place not concealing hairy tips of male copulatory appendages, which are lodged in grooves between segments of the sternal plastron. (See pl. 20, fig. 7.)

Chelipeds of male grossly disproportionate, smooth, naked, faintly reticulate. Merus of larger cheliped heavy, breadth almost equal to length, a superior row of granules culminating in a near-tubercle, and a deep subdistal indentation. Carpus lumpy, a reticulate pattern exteriorly, a blunt tooth at inner angle. Chela gargantuan, approaching half of carapace displacement; palm tumid, nearly as high as wide, inferior border sinuous; dactyl fully as long as superior length of manus, color not covering basal fourth, tip deflexed; fingers meeting with a gape one third as high as wide, teeth white tipped, the larger separated by a denticle, well worn in the male specimen. (See pl. 20, fig. 3.) Minor cheliped a fraction of the size of major, carpus more uneven, manus strongly reticulate, fingers channeled, granulate, meeting without gape, pollex deflexed. (See pl. 20, fig. 4.)

Ambulatory legs moderately slender; merus granulate, especially above; carpus grooved and broadening distally; propodus, particularly of last leg, wide; dactylus long, straight, and pilose; margins of all segments hairy.

Female similar to male except for more nearly proportionate chelipeds. Major chela like minor chela of male except for the more prominent triangular cutting teeth and upturned tip of pollex, crossing dactyl. (See pl. 20, fig. 5.) Minor chela of both sexes alike.

*Color in life:* Carapace and cheliped dull yellow densely speckled with white and hellebore red. Ambulatory legs, including dactyl, yellow touched on upper surface with neutral red. Ventral surface also yellow, densely spotted on abdomen and sternum with red and scattered spots elsewhere. (Petersen)

*Remarks:* The discovery of a *Platyxanthus* in Panamanian waters extends the range of this South American genus into the Northern Hemisphere. The writer is indebted to Mr. Steve A. Glassell for a clue to the affinities of the new species, which differs so remarkably from its congeners in appearance that structural similarities are obscured. These are typically xanthid in form, being from one third to one half broader than long, having the front but little advanced beyond the anterolateral arch, which is dentate rather than tuberculate. While five lateral teeth are the rule in the genus (although any or all may be subdivided), the exorbital in *balboai* is so small and far removed that it is for all practical purposes a four-toothed species. Of the known Pacific *Platyxanthus* it is perhaps nearest *P. cokeri* Rathbun (1930) and most distant from *P. orbignyi* (Milne Edwards and Lucas) (1843), a specimen of which at hand



shows the epistomal and antennular area much less sunken and the flagellum of the antenna lodged in the orbital hiatus in the usual manner. The oblique anterior border of the merus of the outer maxilliped, the quadrid front, well separated from the dentiform orbital angles, the inferior position of the basal antennal article, the disproportionate size of the claws, and the seven free male abdominal segments constitute the argument for placing the proposed new species in the genus *Platyxanthus*.

This handsome and readily distinguished species is named in honor of Vasco Nuñez de Balboa, who near its Panamanian type locality first set eyes on the Pacific Ocean, thereby opening it to conquest by science as well as by Spain.

### Genus **HEXAPANOPEUS** Rathbun

#### **Hexapanopeus costaricensis**, new species

Plate 21, Figs. 1-4

*Type*: Male, holotype, Cat. No. 78779, U.S. National Museum, and female allotype, from Port Parker, Costa Rica, 5 fathoms, sand and shell; February 9, 1935; collected by Allan Hancock Expedition of 1935 at Velero Station 468-35. Six specimens, paratypes, from Puerto Culebra, Costa Rica, 3-10 fathoms, February 24, 1934; 22 specimens, paratypes, same locality, 10 fathoms, February 25, 1934; two specimens, paratypes, from coral, same locality and date; collected by Allan Hancock Expedition of 1934 at Velero stations 254-34, 257-34, and 258-34, respectively.

*Measurements*: Male holotype: length of carapace 5.2 mm., width 6.9 mm., of front 2.6 mm., of fronto-orbit 5.0 mm., length of major chela 5.2 mm., of dactyl 3.4 mm., height of claw 2.8 mm. Female allotype: length 4.0 mm., width 5.6 mm.

*Diagnosis*: Front slightly oblique, almost truncate, without lateral lobes. Second lateral tooth fused with first, their combined width equal to that of the third. Fourth and fifth teeth acute, thickened, and upturned. Chelae with prominent superior sulci. Carpus of walking legs deeply furrowed. Tip of male abdomen broad, rounded.

*Description*: Carapace hexagonal, regions well defined both anteriorly and posteriorly, granules becoming more distinct toward lateral and frontal margins and larger on the transverse gastric and branchial ridges.

Front thick, but not double edged, almost truncate, the merest suggestion of advancement on either side of the shallow median V and at the external angles, which are broadly rounded. Inner orbital tooth conspicuously separated from front, as large as, but less acute than, the exorbital, which it neatly apposes. Supraorbital tooth rounded, edge granulate, more advanced toward internal than near external orbital fissure. Exorbital or first lateral tooth completely fused with the second, their combined width being exactly equal to that of the third, edge granulate and sinuous. Third tooth broadest, tip almost rectangular, outer margin almost straight, obliquely angled at base, inner margin slightly concave with several denticles. Fourth and fifth teeth acute, upturned, thickened; carapace widest at fourth tooth, fifth smaller and postlateral in position. Prominent transverse ridges of carapace located on epigastric and mesobranchial regions; shorter transverse elevations, consisting of but a few granules surmounted by a hair, located on postfrontal, cardiac, and postbranchial regions; hepatic areas raised but without distinct ridges. Two thickened, granular elevations in advance of posterior margin of carapace.

Antennules folding obliquely, almost transversely. Basal antennal article meeting lateral extension of front, flagellum lodged in orbital hiatus. Lower orbital margin with beadlike granules; inner tooth advanced, outer notch deeply indicated. Merus of third maxilliped granular, proximal and distal margins subparallel, inner edge rounded, a slight concavity for the insertion of the granulate and hairy palpus.

Chelipeds unequal, coarsely granulate, and sparsely pubescent. Merus with a subterminal tooth. Carpus with three prominent tubercles in addition to the blunt spine at the anterointernal angle; granules arranged proximally in a rugose pattern; a broad, shallow sulcus paralleling the outer, distal border. Manus with a granular superior crest deeply furrowed, height of palm exceeding superior length, outer and lower two thirds of surface smooth and bare. Fingers channeled above, deflexed, incurving, a large tooth at base of dactyl of major claw, pollex irregularly denticulate, color not extending on palm. Fingers closing with a slight gape, tips crossing.

Ambulatory legs granulate, compressed. Superior margin of merus with sharpened granules and plumose hairs. Carpus deeply furrowed. Propodus wide with conspicuous hairs and acuminate granules on inferior margin. Dactyl finely granulate, pubescent, horny tip short and abruptly angled.

Abdomen of male with third segment narrower than first, second narrower than third. Terminal segment broader than long, tip rounded. Abdomen and sternum paved with fine, flat granules.

*Distribution:* The 33 specimens referred to this species all come from Costa Rican stations.

*Remarks:* The proposed new species occupies a range which overlaps that of two other common Pacific *Hexapanopeus*, *H. sinaloensis* Rathbun (1930) and *H. orcutti* Rathbun (1930). From the former it may be distinguished by the fused first and second lateral teeth, separated in *sinaloensis* by a U-shaped sinus and by the subquadrate merus of the outer maxilliped, that of *sinaloensis* being subtriangular. (See pl. 21, fig. 4.) From *H. orcutti* it may be separated by the absence of outer frontal lobes, the fusion of the first two lateral teeth, the presence of a basal digital tooth, and the fact that the color of the fingers ends abruptly at the interdigital sinus, that of *orcutti* extending some distance on the palm. (See pl. 21, fig. 2.)

In many respects the new species comes closest to *H. cartagoensis* Garth (1939) from the Galapagos Islands. However, the more nodose carpus and the superior furrows of the cheliped, the more nearly truncate and lobeless front, and the greater width of the male terminal abdominal segment of *H. costaricensis* will serve to distinguish it clearly. (See pl. 21, fig. 3.)

A complete analysis of the Pacific species of *Hexapanopeus* with keys to new species described from Hancock collections will appear in a forthcoming report.

## Genus **HETERACTAEA** Lockington

### **Heteractaea peterseni**, new species

Plate 22, Figs. 1-5

*Type:* Female, holotype, Cat. No. 79151, U. S. National Museum, from north end of channel, Octavia Bay, Colombia, 35-40 fathoms, coarse sand gravel, specimen cracked from rock; January 27, 1935; collected by Allan Hancock Expedition of 1935 at Velero Station 429-35.

*Measurements:* Female holotype: length of carapace 17.5 mm., width 26.8 mm., of front 7.3 mm., of fronto-orbit 14.3 mm., length of major cheliped 27.8 mm., of major chela 16.5 mm., of dactyl 8.9 mm., height of palm 9.6 mm.

*Diagnosis:* Anterior two thirds of carapace covered with raised, truncate areoles and tubercles. Edge of front thin. Orbits with two naked, thickened, lobate processes above, two below. Anterolateral margins irregularly spinulose. Merus of walking legs with a bladelike terminal spine; propodus with two laminate crests and an intervening gutter.

*Description:* Carapace approximately two thirds as long as broad, flattened posteriorly, deflexed anteriorly and toward the anterolateral margins, regions well defined. Anterior two thirds of carapace areolate, the areoles becoming increasingly upstanding and truncate anteriorly and laterally, a fine pubescence between them. Posterior third of carapace nontuberculate but coarsely and irregularly granulate.

Front broad, truncate, about two sevenths of total width, a slight median emargination, edge thin and sinuous in frontal view. (See pl. 22, fig. 2.) Orbits consisting of two naked, thickened, lobate processes above and two below, the former pair the better separated; outer notch distinct. Anterolateral margins armed with numerous spines and spinules, the larger of which are forward curving, their accessory spinules as likely to curve backward, giving the margin an exceedingly rough and irregular appearance. Lateral spine coarser and longer than other marginal spines and separated from them by a deep, U-shaped emargination from which point the margin trends forward to the corners of the buccal cavity. Principal prominences of carapace disposed as follows: three low, small areoles on mesogastric area in the form of a trefoil, two larger areoles on each epigastric region, the outer pair truncate and preceded by a sharp cluster of spinules; two hepatic tubercles at the same level; two pairs of truncate areoles posterior to the front; two mesobranchial areoles just below the hepatic; one inner branchial areole below the outer of the two epigastric; two broad blades at the level of the lateral spines and two clusters of spinules above them.

Antennules folding transversely, separation of fossae complete; basal article of antennae short, barely reaching front; second article lodged in orbital hiatus. Antennae three fourths as long as width of front. Epistome broad, channeled, lower edge emarginate. Merus of third maxilliped roughly rectangular, anteroexternal angle produced and granulate, anterointernal angle flaring to form a substantial support for the large, hairy palpus. Ischium broad, inner margin granulate, a tiny basal process impinging on the exopodite. (See pl. 22, fig. 5.)

Chelipeds unequal, merus of the larger concealed beneath carapace; carpus and manus roughened by spine-tipped tubercles interspersed with

a fine pile, manus with the four largest tubercles forming a superior crest; outer surface of palm completely roughened, spines on lower half of hand arranged in longitudinal rows. Fingers ribbed and channeled, prehensile edges strongly toothed, tips incurving; dactyl with a tubercle and three spinules above. (See pl. 22, fig. 3.) Minor chela similar to major except that tubercles are even more attenuated, fingers more slender, the dactyl provided with two rows of sharp spinules.

Meri of all ambulatory legs spinulous above, granulate below, spinules increasing in size distally, terminal spine a bladeliike process. Carpi with two parallel laminate ridges with sinuous margins between which runs a deep, smooth channel, U-shaped in cross section. Propodi with a double row of long, sharp spines. Dactyli exceeding length of propodi, horn tipped; all segments short pubescent with longer marginal hairs. (See pl. 22, fig. 4.)

Female abdomen with each segment constricted at base, giving edges a scalloped appearance. Terminal segment nearly as long as broad, sides arcuate.

*Color in life:* Carapace bright apricot orange, pubescence pale old gold. Front, orbit, and eyestalk varying shades of orange, cornea brilliant pansy purple. Chelae reddish orange chrome with tips of tubercular spines nearly white. Fingers brilliant aster purple, extreme tips nearly white. Ambulatory legs lighter than carapace with faint indications of a light band on each segment; rims of carpus with a strong purplish hue. (Petersen, taken from an immature female specimen dredged in the Gulf of California, February 13, 1940.)

*Distribution:* The finding of a female and one young specimen three miles southwest of San Francisco Island, Gulf of California, Mexico, in 43-44 fathoms at Velero Station 1116-40, extends the known range of this species thousands of miles northward from Octavia Bay, Colombia, the type locality.

*Remarks:* The proposed new species is placed, with some uncertainty, in the American genus *Heteractaea* because of the thickened orbital border, lobed below as well as above, the spinulous anterolateral margin trending forward and downward to the anterior corners of the buccal cavity, and the remarkable processes of the carpi of the ambulatory legs which, while not lunate crests, are sufficiently similar in configuration to suggest affinity. The front, while not thick, bears a pair of thickened lobes just posterior to it in exactly the same manner as in *H. lunata* (Milne Edwards and Lucas) (1843). A comparison with specimens of

the latter reveals a similarity greater than one would be led to expect from written descriptions only, in that antennal and orbital regions, chelipeds, and maxillipeds conform to a remarkable degree.

An interesting note made by Dr. Waldo L. Schmitt at the time of capture, "cracked from rock," furnishes a possible clue to the use made of the channeled carpi. If this crab inhabits rocky crevices into which it wedges itself securely, may not the ambulatory legs, when held tightly against the under side of the carapace, form gutters for the incurrent and excurrent sea water, effective as prolongations of the afferent and efferent branchial channels?

This species is dedicated to Mr. Anker Petersen, scientific artist, in the full realization that he has depicted it more accurately in line and stipple than I can hope to do in words.

Genus **PILUMNOIDES** Milne Edwards and Lucas

**Pilumnoides rotundus**, new species

Plate 23, Figs. 1-5

*Type*: Female, holotype, Cat. No. 374, Allan Hancock Foundation, The University of Southern California, from San Esteban Island, Gulf of California, Mexico, 35 fathoms, shell; March 27, 1937; collected by Allan Hancock Expedition of 1937 at Velero Station 729-37. Male, allotype, Cat. No. 374a, from south end of Tiburon Island, Gulf of California, Mexico, 8-10 fathoms, kelp, corallines; March 10, 1936; collected by Allan Hancock Expedition of 1936 at Velero Station 564-36. Three females and one young, paratypes, from San Francisquito Bay, Lower California, Mexico, 165 fathoms, shale and mud; March 1, 1936; and one female, ovigerous, paratype, from the same locality, 125 fathoms, shale, rock, and mud; March 2, 1936; collected by Allan Hancock Expedition of 1936 at Velero stations 529-36 and 534-36, respectively.

*Measurements*: Female holotype: length of carapace 7.4 mm., width 8.8 mm., of fronto-orbit 5.2 mm., length of major manus 4.9 mm., height 3.5 mm. Male allotype: length 7.4 mm., width 8.7 mm.

*Diagnosis*: Carapace granulate posteriorly as well as anteriorly. Oblique prolongation from lateral angles wanting. Orbits with superior fissures obliterated. Merus of third maxilliped produced at outer distal angle. Manus externally hairy.

*Description*: Carapace suborbicular, rotund, slightly broader than long, and narrowing posteriorly. Regions well defined anteriorly, oblit-

erated posterior to the cardiac area, oblique prolongation from lateral angles wanting. Granules of carapace beadlike and regularly placed posteriorly, becoming sharper, more crowded, and irregularly placed toward the frontal and lateral margins. Front narrow, about one third carapace width, thickened, bilobed, granulate. Orbits subcircular, superior fissures obliterated, a notch at external angle. Of the anterolateral teeth, only the first two in addition to the exorbital are distinct and tuberculate, the remainder of the margin consisting of single, sharpened granules, alternately large and small. Greatest width of carapace slightly in advance of lateral angle. Postfrontal, protogastric, gastric, and hepatic regions coarsely tuberculate, sparsely hairy, raised, and separated by deep, naked sulci, giving the anterior portion of the carapace a decidedly areolate appearance. Cardiac, intestinal, and postbranchial regions low, confluent, and paved with beaded granules; a straight row of minute granules above the posterior margin.

Antennular fossae large, antennules folding obliquely above the broad septum. Antennae short, basal article all but concealed by prominent inner suborbital tooth, second article barely touching front. Epistome sinuous. Endostomial crest emarginate. Anteroexternal angle of merus of outer maxilliped produced acutely, inner angle sharpened, a prominent notch for the insertion of the large, somewhat compressed, hairy palpus. (See pl. 23, fig. 4.)

Chelipeds massive, merus totally concealed in dorsal view, carpus slightly exceeding manus in displacement, roughly tuberculate and hairy, a prominent median depression near its distal extremity. Manus with three large, compressed, sharpened teeth forming the superior crest; lower half of palm with a dense covering of plumose hairs through which granules arranged in rows are discernible. Fingers *Pilumnus*-like, stout, tips crossing; pollex greatly shortened, two flattened teeth near tip; dactyl correspondingly deflexed, channeled, tip pointed, a superior tubercle at base.

Abdomen of male with seven free segments. (See pl. 23, fig. 3.)

Walking legs finely pubescent; meri with superior margins sharp granulate; carpus with a double row of granules, widening distally; propodus widest; dactylus with a fine, yellow, pointed nail.

*Color in life:* Carapace dull ochraceous buff with varicolored granules, most chrome orange, some carmine red, and others bright cadmium orange. Ground color of chelae reed yellow with granular spines scarlet red. Fingers sayal brown. Merus of ambulatory legs yellowish cream buff

with two broad bands of orange. Carpus and propodus orange red, dactylus white, touched with red at base. (Petersen, taken from a male specimen secured in the Gulf of California at Velero Station 1059-40.)

*Remarks:* The proposed species gives the North Pacific Ocean its first representative of a genus found in the North and South Atlantic and in the South Pacific. As might be expected, it is a more nearly perfect analogue of the species from the North Atlantic, *Pilumnoides nudifrons* (Stimpson) (1871), than of the Peruvian and Chilean *P. perlatus* (Poëppig) (1836), type of the genus. With *P. hassleri* A. Milne Edwards (1880) from Uruguay and the Straits of Magellan it has little in common.

Compared to *P. nudifrons*, the new species agrees remarkably on structural points, such as orbital configuration, size and relationship of the antennular and antennal areas, endostomial emargination, and shape of the external maxilliped. The most remarkable conformity is in the height and length of the fingers and the type and location of the pubescence of the hand. (See pl. 23, fig. 2.) Dissimilarity is encountered in the naked front of *nudifrons*, almost continuous instead of bilobate, its four anterolateral teeth without denticles between, its almost smooth, though hairy, carapace (except for hepatic tubercles), and its more hexagonal, less rotund appearance.

Compared to *P. perlatus*, the new species lacks the two supraorbital fissures, the compressed anterolateral margins, the transverse striae, including the line inward from the lateral angle, and the smooth posterior half of the carapace and ambulatory legs. The hands of *perlatus* are devoid of hairs, and the merus of the third maxilliped is rounded but not attenuated as in *rotundus*.

## GONEPLACIDAE

Genus **PSEUDORHOMBILA** Milne Edwards

***Pseudorhombila xanthiformis***, new species

Plate 24, Figs. 1-5

*Type:* Female, holotype, Cat. No. 3810, Allan Hancock Foundation, The University of Southern California, from north of Gorgona Island, Colombia, 40-60 fathoms, mud and rock; February 24, 1938; collected by Allan Hancock Expedition of 1938 at Velero Station 854-38.

*Measurements:* Female holotype: length of carapace 15.1 mm., width 22.0 mm., of front 6.5 mm., of fronto-orbit 12.6 mm., length of cheliped 25.0 mm., of chela 14.7 mm., of major dactyl 8.0 mm.



*Diagnosis:* Carapace granulate, regions defined. Merus of outer maxilliped produced at anteroexternal corner. Carpus of major cheliped obliquely quadrilateral. Anterolateral teeth four, margin upturned. A hepatic cluster of granules. Outer third of palm smooth, punctate.

*Description:* Carapace very convex longitudinally, less so from side to side; anterolateral margins upturned. Regions defined, surface granulate, granulations becoming larger and rougher toward the arcuate anterolateral margins, sulci smooth and bare. Front between one-third and one-fourth times width of carapace, truncate, edge thin, a slight emargination, and an inconspicuous outer lobe. Orbits elongate oval, separated from front by a shallow but distinct sulcus, closed fissures above indicated only by the slight convexity of the intervening margin. Anterolateral teeth four beside exorbital, well separated, triangular, and granulous margined; the first small, well removed from the orbit; the second larger, broader, and obtusely angled; third tooth largest, tip almost hooked forward; fourth tooth slender, directed obliquely upward; width of carapace at third and fourth teeth subequal. Posterolateral border longer than anterolateral, sides sharply converging. A prominent cluster of subhepatic granules.

Antennules folding transversely, separated by a strong median septum. Basal antennal article small, far removed from buccal cavity, flagellum lodged in orbital hiatus. A prominent inner suborbital tooth with a broad, lamellar tooth separated from it. Epistome broad with a transverse carina. Merus of outer maxilliped broader than long, anteroexternal angle strongly produced. (See pl. 24, fig. 4.)

Chelipeds of female similar but unequal. Merus with a granular ridge terminating in a transverse sulcus. Carpus of major claw obliquely quadrilateral, a stout spine at inner angle and a well-defined sulcus parallel to the distal border. Chela, like carpus, granulate; granules arranged proximally in rows; outer third of palm smooth and minutely punctate. Fingers long, slender, tapering, deflexed, slightly incurving, meeting with but a slight gape, and irregularly toothed. Basal lobe on dactyl lacking in minor hand. Height of palm equal to superior margin. (See pl. 24, fig. 3.)

Ambulatory legs slender, attenuated, pubescent; merus and carpus granulate above. Dactyls long, straight, and slender, that of leg four slightly upcurving.

*Remarks:* The reference of the proposed new species to the genus *Pseudorhombila* Milne Edwards (1837) instead of *Oediplax* Rathbun

(1893) is based upon the examination of the type of *P. octodentata* Rathbun (1906) (U.S.N.M. Cat. No. 32690) from Dominica, W.I., and a cotype of *P. quadridentata* (Latreille) (1825) (U.S.N.M. 20280), type of the genus, type locality unknown, a gift of the Paris Museum, as well as upon the type of *Oediplax granulata* Rathbun (1893) (U.S.N.M. 17465) from Consag Rock in the Gulf of California. The characters to which most importance is attached are the shape of the merus of the third maxilliped and of the carpus of the cheliped. In the new species the merus is distinctly produced as in *Pseudorhombila* instead of quadrate as in *Oediplax*. With regard to the shape of the carpus, our specimen is frankly intermediate between the two genera, but still sufficiently angled to be called obliquely quadrilateral, instead of oval, as in *Oediplax*.

Since the remaining characteristics upon which Miss Rathbun's genus *Oediplax* was based, namely, the relative proportion of front to carapace width and of anterolateral to posterolateral margins, are not borne out by the second specimen of the type series, a small female, nor by other small specimens in the Hancock collections, the necessity for the genus *Oediplax* would seem debatable. Until more specimens, particularly males, are obtainable, it will be impossible to settle this point satisfactorily.

### Genus **CYRTOPLAX** Rathbun

#### **Cyrtoplx panamensis** Ziesenhenné, new species

Plate 25, Figs. 1-4

*Type*: Male, holotype, Cat. No. 388, Allan Hancock Foundation, The University of Southern California, and female, allotype, from Bahia Honda, District of Veraguas, Panama, 30-50 fathoms off North Island; March 1, 1938; three males and one female, paratypes, same locality and date; collected by Allan Hancock Expedition of 1938 at Velero Station 863-38. One female, paratype, same locality, shore; March 9, 1933; one male, paratype, same locality, 30-50 fathoms; March 28, 1939; collected by Allan Hancock Expeditions of 1933 and 1939 at Velero stations 111-33 and 948-39, respectively.

*Measurements*: Male holotype: length of carapace 5.4 mm., width 8.2 mm., width of front 2.9 mm., of fronto-orbit 5.7 mm., length of major chela 5.6 mm., of major dactyl 3.2 mm. Female allotype: length of carapace 5.1 mm., width 7.8 mm.

*Diagnosis*: Carapace broadly hexagonal, length two thirds width. Wrist coarsely granulate, a single, sharp spine at inner angle and a

cluster of spinules beneath it. Third lateral tooth obtuse, blunt, and with a serrate edge; larger than other teeth. Carapace widest at fourth lateral tooth.

*Description:* Carapace broadly hexagonal, about two thirds as long as wide, more convex longitudinally than transversely, hairy, gastric areole prominently indicated. Front approximately one third the width of the carapace, its lobes slightly convex, median notch shallow, edge thin. Eyestalks narrowing distally, a slight constriction at base of cornea. Orbits transverse, not separated from the front by a prominence, trending outward rather than forward, a superior fissure internally and a notch externally separating the broad, low, granulate, slightly convex lobe from the obtusely angled and little-advanced exorbital tooth. Lateral teeth five in number, counting the exorbital, slightly upturned, edges serrate or denticulate; second tooth low, rounded, and separated from the first by a shallow U; third tooth obtuse and blunt, larger and more prominent than other teeth, bearing several conspicuous denticles on its inner slope; fourth tooth smaller, acute, outer margin curved, inner margin straight, carapace widest at this level; fifth tooth postlateral in position, small and sharp. Posterolateral margins exceeding anterolateral and moderately convergent. Two depressions at the union of the postbranchial and metagastric regions.

Antennules large, folding transversely. Antennae minute, lodged in the orbital hiatus; flagella extending beyond eyes, slender. Epistome short. Buccal cavity broadening anteriorly. Merus of outer maxillipeds broader than long, exterior angle produced, rounded, interior angle faintly notched to receive the short, thick, hairy, cylindrical palpus. (See pl. 25, fig. 4.)

Chelipeds massive, unequal, hairy. Merus with a subterminal tooth surmounted by several sharp granules. Major carpus subglobular, granulate, bearing a single, short, sharp spine (broken in the holotype specimen) at its inner superior angle and a row of three or four spinules beneath it; a sulcus parallel to the margin adjoining the palm. Major manus bare and glistening; palms convex above and beneath; superior margin with two parallel granulate ridges interspersed with long, shaggy hairs and extending on to the dactyl, which curves inward. Fingers of major manus irregularly toothed, pollex scarcely deflexed, meeting dactyl with an elongate gape. Fingers of minor manus more slender, lower margin of manus almost straight. Color of fingers not continued on palms. (See pl. 25, fig. 2.)



Merus of ambulatory legs moderately slender, hairy, compressed, and minutely spinulose along anterior margin. Carpus hairy above, propodus along inferior margin as well. Dactylus densely hairy with an amber tip; dactylus of fourth leg outcurving.

Male abdomen widest at segment three, which does not completely cover the sternum, narrowest at base of segment six; tip of seventh segment broadly rounded. (See pl. 25, fig. 3.)

*Color in life:* Carapace cream color overcast with buffy brown. Fingers pale lilac, dactyls of ambulatory legs white. Ventral side pale cream buff with tinge of lilac. Legs pale cream buff and lightly touched with reddish brown. (Petersen)

*Distribution:* The 60 specimens collected at 15 Velero stations by Allan Hancock Expeditions range from north of Angel de la Guardia Island, Gulf of California, Mexico, to Port Utria, Colombia, from shore to 70 fathoms.

*Remarks:* Since the appearance of Bulletin 97 of the U. S. National Museum (1917), Miss Rathbun has described two new species of *Cyrtoplax* from the west coast of the Americas, calling each in turn the Pacific counterpart of *C. spinidentata* (Benedict) (1892) without reference to the other. The same designation accompanied her determination of the new species described above by Mr. Ziesenhenné. After consulting types the writer believes that *C. schmitti* Rathbun (1935), a large, glabrous species, is the most nearly perfect analogue of the Atlantic species. *C. valeriana* Rathbun (1928) appears to be outside the scope of the genus as conceived by him. Mr. Ziesenhenné's species is unlike any other *Cyrtoplax* examined, having a superficial resemblance to *Chasmophora macrophthalmia* (Rathbun) (1898) from the same Panamic region. However, the possession of five anterolateral teeth instead of the four of *Chasmophora* and the ratio of fronto-orbital to total width (5 to 7 instead of 6 to 7) definitely removes this possibility.

An analysis of the American species of *Cyrtoplax*, exclusive of *C. valeriana*, will appear in a forthcoming paper.

## Genus CHASMOCARCINUS Rathbun

### *Chasmocarcinus longipes*, new species

Plate 26, Figs. 1-5

*Type:* Female, holotype, Cat. No. 389, Allan Hancock Foundation, The University of Southern California, from Secas Islands,

Panama, three fathoms, mud; March 2, 1938; collected by Allan Hancock Expedition of 1938 at Velero Station 865-38. Four males and one female, paratypes, from Port Utria, Colombia, 20 fathoms; February 14, 1934; collected by Allan Hancock Expedition of 1934 at Velero Station 233-34.

*Measurements:* Female holotype: length of carapace 8.5 mm., width at posterior border 11.9 mm., at lateral angles 10.2 mm., width of front 1.8 mm., of fronto-orbit 4.6 mm., length of cheliped 14.6 mm., of manus 7.5 mm., of dactyl 4.9 mm., of fourth ambulatory leg 20.6 mm.

*Diagnosis:* Carapace broad anteriorly. Front advanced, bilobed. Fingers greatly elongated. Third ambulatory leg more than twice the width of carapace measured at lateral angles. Merus of third maxilliped elongate oval.

*Description:* Carapace superficially smooth and bare, microscopically granulate; length between two-thirds and three-fourths times width; lateral margins less convergent anteriorly than those of *C. latipes* Rathbun (1898). Front advanced beyond general outline of carapace. Orbits curving forward and downward to a broad exorbital lobe which turns backward to become the granulate anterolateral margin. Gastric area indicated by two shallow longitudinal furrows connected by a transverse furrow in the form of an H. Branchial regions swollen. Greatest width of carapace at posterior margin. Antennules folding transversely beneath the front. Antennae long and slender. Epistome diamond shaped. Merus of third maxilliped longer than broad, oval; tip of palpus hairy. Female abdomen and sternum finely granulate.

Female chelipeds subequal, carpus and manus smooth and glabrous. Merus with a superodistal tubercle surmounted by hairs. Carpus with a granulate outer margin and a sharpened tooth at inner angle bearing a cluster of hairs. Manus with short superior margin. Fingers slightly deflexed, long, straight, slender, prehensile edges alternately large and small spinulose, tips incurving. Inferior margin of hands with a hairy ridge. Male chelipeds increasingly disproportionate with age. Manus of half-grown male as high as broad, upper and lower borders subparallel, smooth and bare except for a strip of fine granulation across lower proximal corner. Fingers strongly deflexed, meeting with an elongate gape, tips incurving. Dactyl with outer margin slightly concave, almost straight, three subequal teeth at base; pollex also with three denticles opposite basal constriction. Minor chela of male as described for female. (See pl. 26, figs. 2 and 3.)

Ambulatory legs smooth, margins finely pilumnose. Meri of ambulatory legs slender; merus of leg three almost five times as long as wide; carpus, propodus, and dactylus similarly attenuated. Length of third ambulatory leg over twice the width of carapace at lateral angles. Second leg next in length; fourth shortest, its dactyl curving strongly outward.

*Color in life:* Carapace deep olive buff with large, irregular patches of citrine drab almost covering frontal, cardiac, gastric, and branchial areas. Eye reddish purple. Ambulatory legs lighter than carapace and netted lightly with neutral red. Fingers apricot orange gradually fading to white tips. Ventral side cream buff. (Petersen)

*Distribution:* The 28 specimens collected by Allan Hancock Expeditions at 8 Velero stations range from Secas Islands, Panama, to La Plata Island, Ecuador, from shore to 50 fathoms.

*Remarks:* This species may be separated from *C. latipes* Rathbun (1898), as shown by examination of the type (U.S.N.M. No. 21592), by its greater anterior width and less converging sides, by the configuration of the bilobed front and forward curving orbits, by the greatly elongated third ambulatory leg and slender meri of all the ambulatories with almost straight anterior margins, and by the proportionately longer and narrower ischium and merus of the outer maxilliped. In male specimens of any size the asymmetrical cheliped with its high palm and deflexed fingers becomes the most conspicuous distinguishing feature, the chelae of *C. latipes* males, of whatever age, remaining equal and similar.

The same differences will serve to distinguish the proposed new species from *C. ferrugineus* Glassell (1936), the type of which, in the laboratories of the Institute for Tropical Research of the New York Zoological Society, was examined through the courtesy of Dr. William Beebe and found to be identical with Miss Rathbun's species. The ruddy color of the Zaca specimen is due to a ferruginous mud in which *C. latipes* frequently occurs and may be removed with a stiff brush. The difference in orbital configuration is negligible.

The Atlantic *Chasmocarcinus* most nearly analogous to the proposed new species appears to be *C. cylindricus* Rathbun (1901). As shown by an examination of the type (U.S.N.M. No. 23765) from Puerto Rico, it has the broad front, the slender meri, and the spinulous fingers of *longipes*, but the joints of the third ambulatory leg are relatively short, and the merus of the maxilliped is even rounder than in *latipes*.

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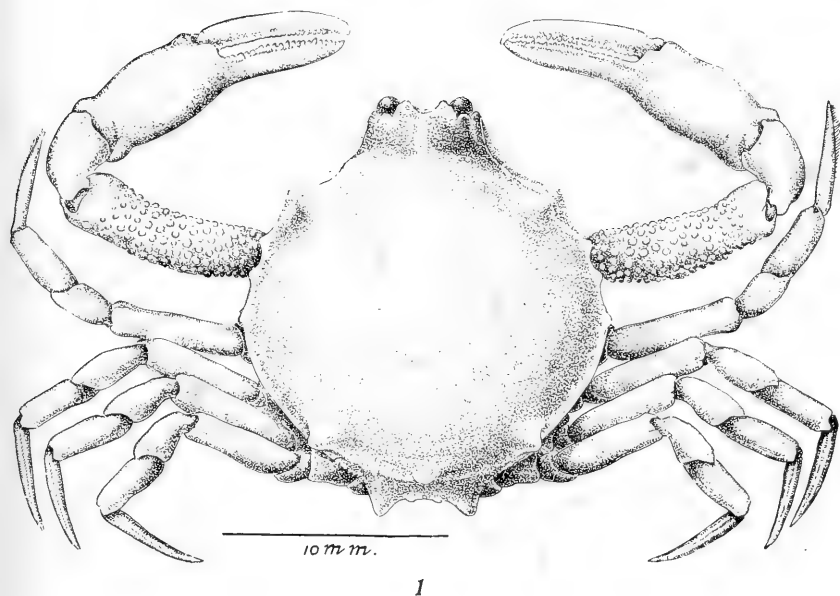
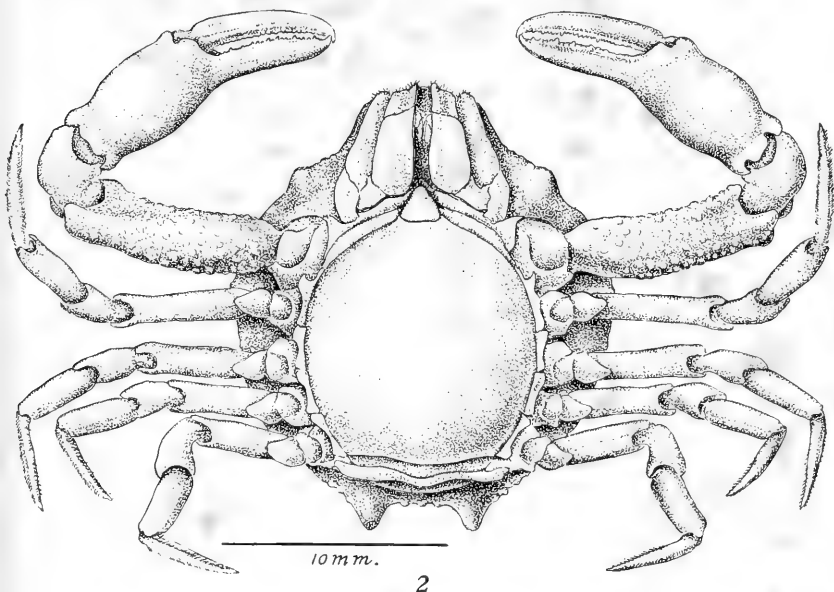
## PLATE 11

*Randallia angelica*, new species

Female holotype

Fig. 1. Dorsal view.

Fig. 2. Ventral view.



## PLATE 12

*Osachila sona*, new species

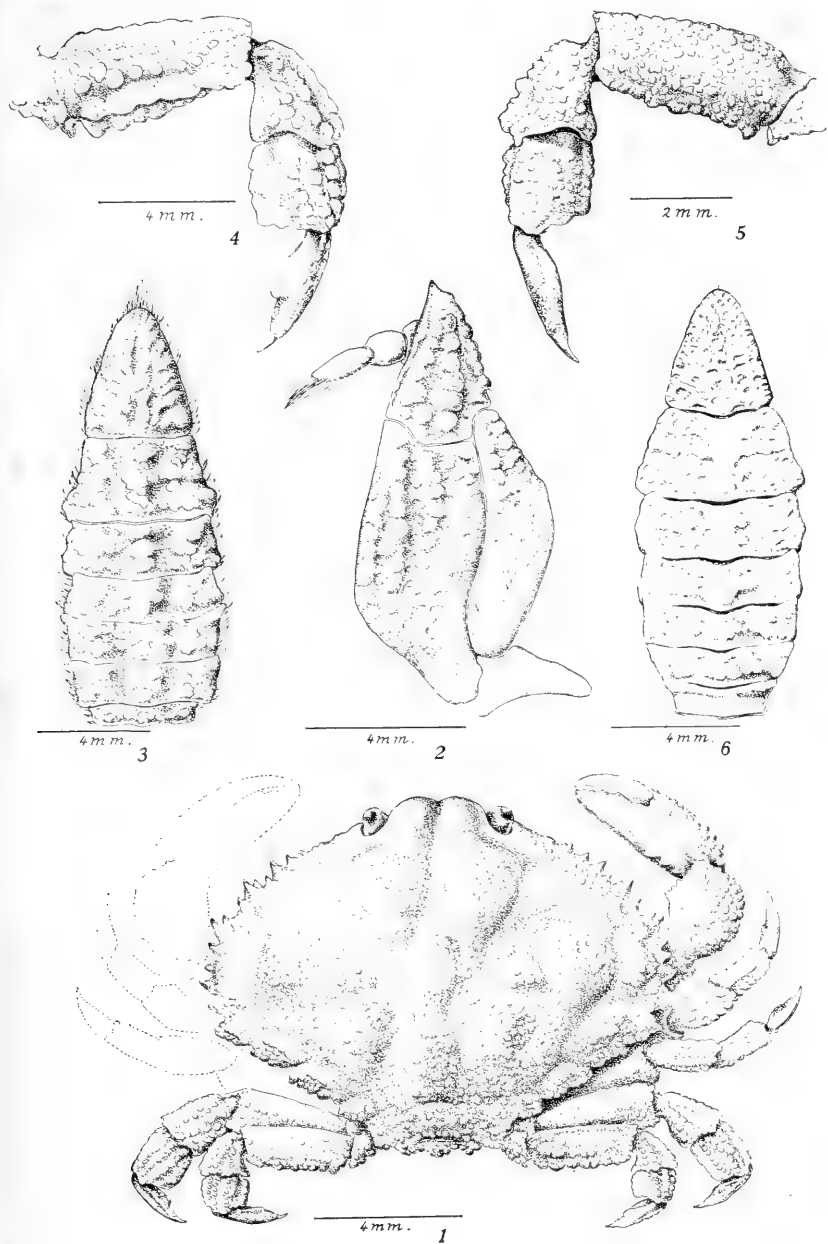
Female holotype

- Fig. 1. Dorsal view.
- Fig. 2. Left outer maxilliped.
- Fig. 3. Female abdomen.
- Fig. 4. Fourth ambulatory leg.

*Osachila galapagensis* Rathbun

Female paratype

- Fig. 5. Fourth ambulatory leg.
- Fig. 6. Female abdomen.

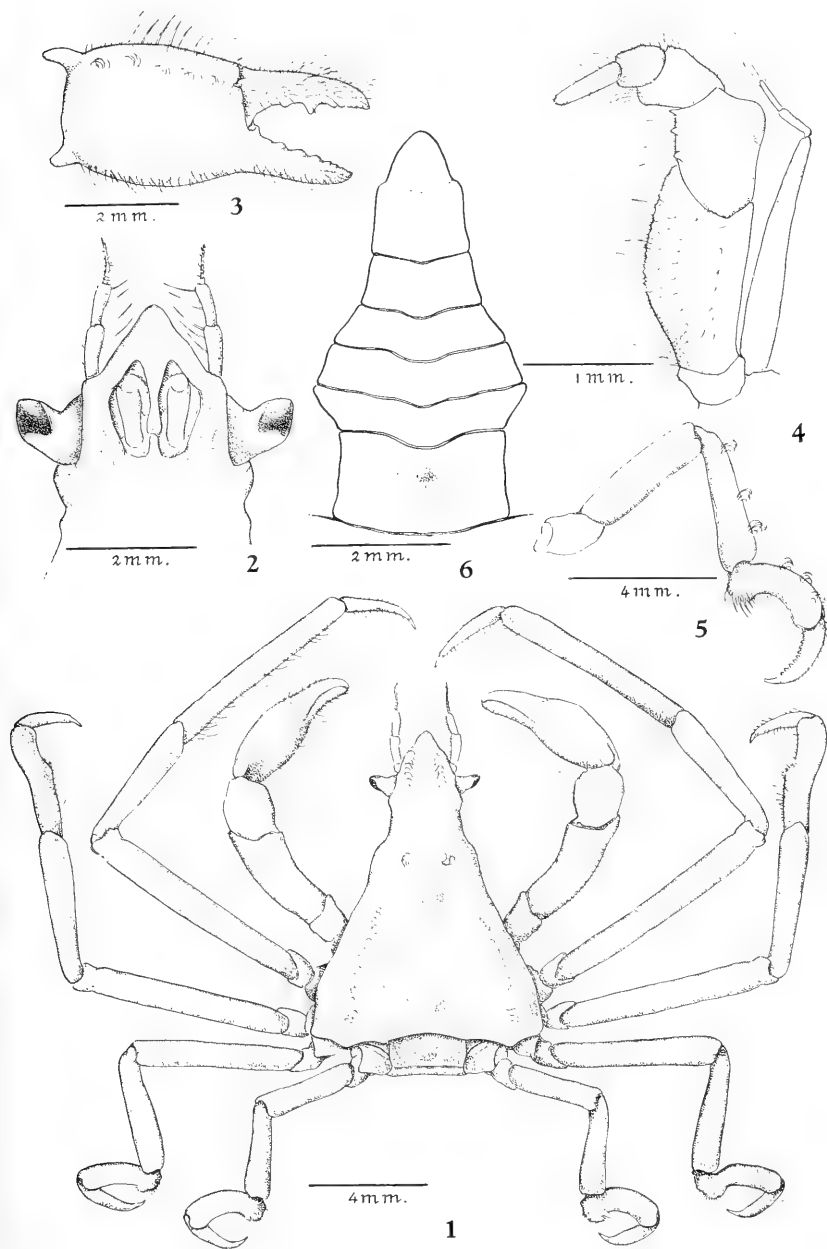


## PLATE 13

*Podochela ziesenhenei*, new species

Male holotype

- Fig. 1. Dorsal view.
- Fig. 2. Ventral view of front.
- Fig. 3. Right chela.
- Fig. 4. Left outer maxilliped.
- Fig. 5. Fourth ambulatory leg.
- Fig. 6. Abdomen.



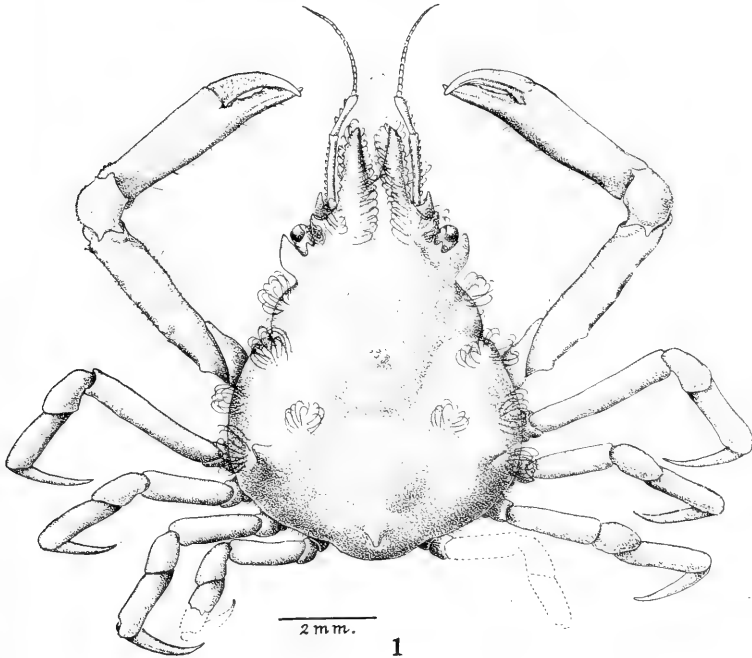
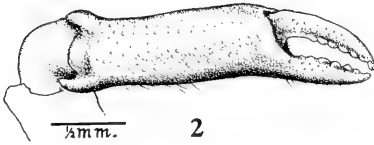
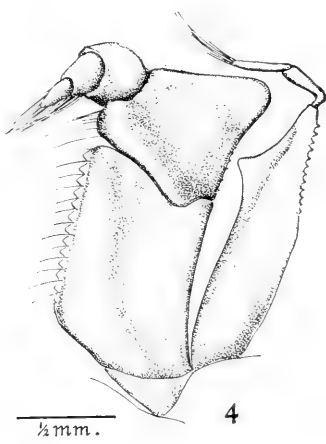
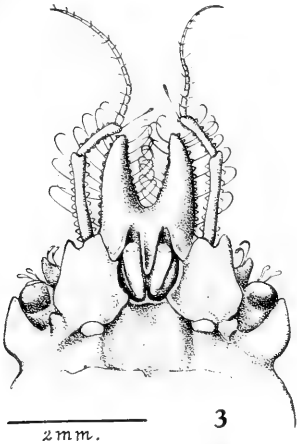
## PLATE 14

*Notolopas mexicanus*, new species

Male holotype

- Fig. 1. Dorsal view.
- Fig. 2. Right chela.
- Fig. 3. Ventral view of front.
- Fig. 4. Left outer maxilliped.





## PLATE 15

*Mithrax (Mithrax) clarionensis*, new species

Female holotype

Fig. 1. Dorsal view.

Fig. 2. Ventral view of orbit.

Fig. 3. Dorsal view of orbit.

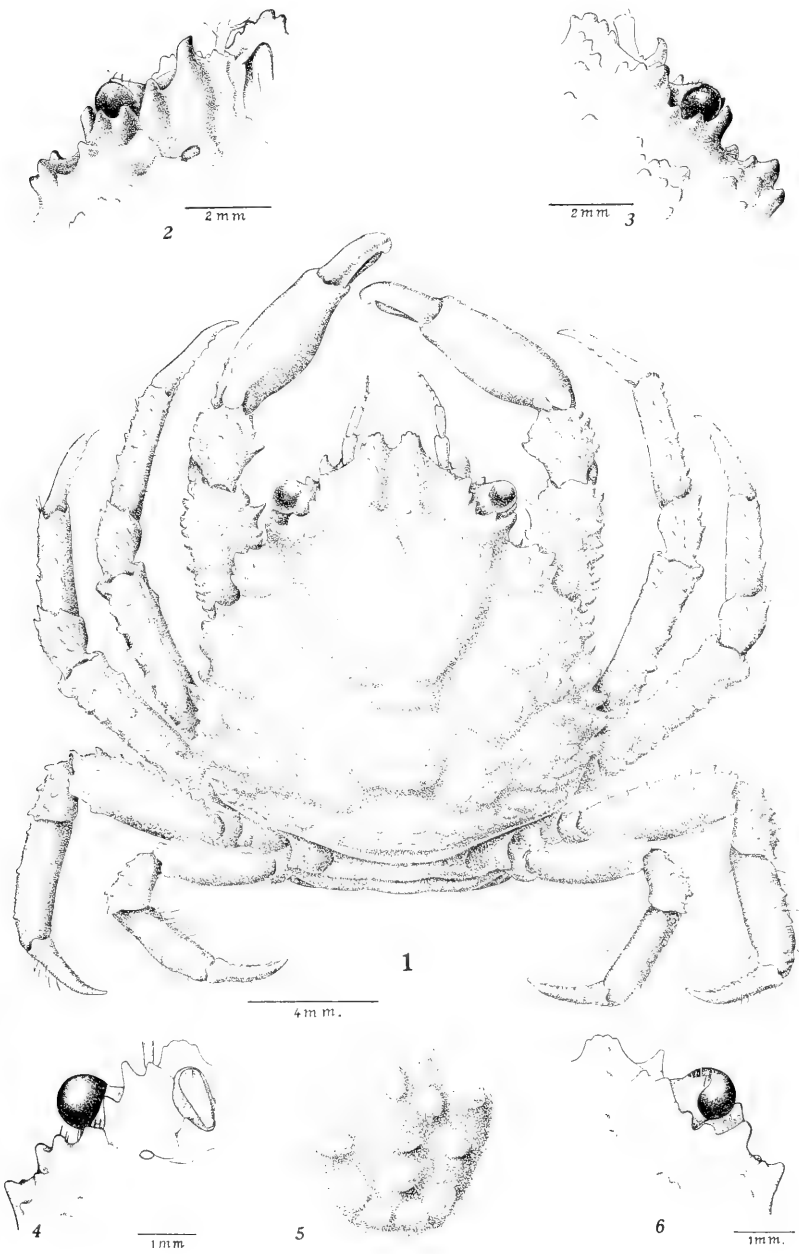
*Mithrax (Mithrax) sinensis* Rathbun

Fig. 4. Ventral view of orbit, male holotype.

Fig. 5. Gastric shield.

Fig. 6. Dorsal view of orbit, male holotype.

(Figures 4 and 6 drawn by Miss Jane Roller.)



## PLATE 16

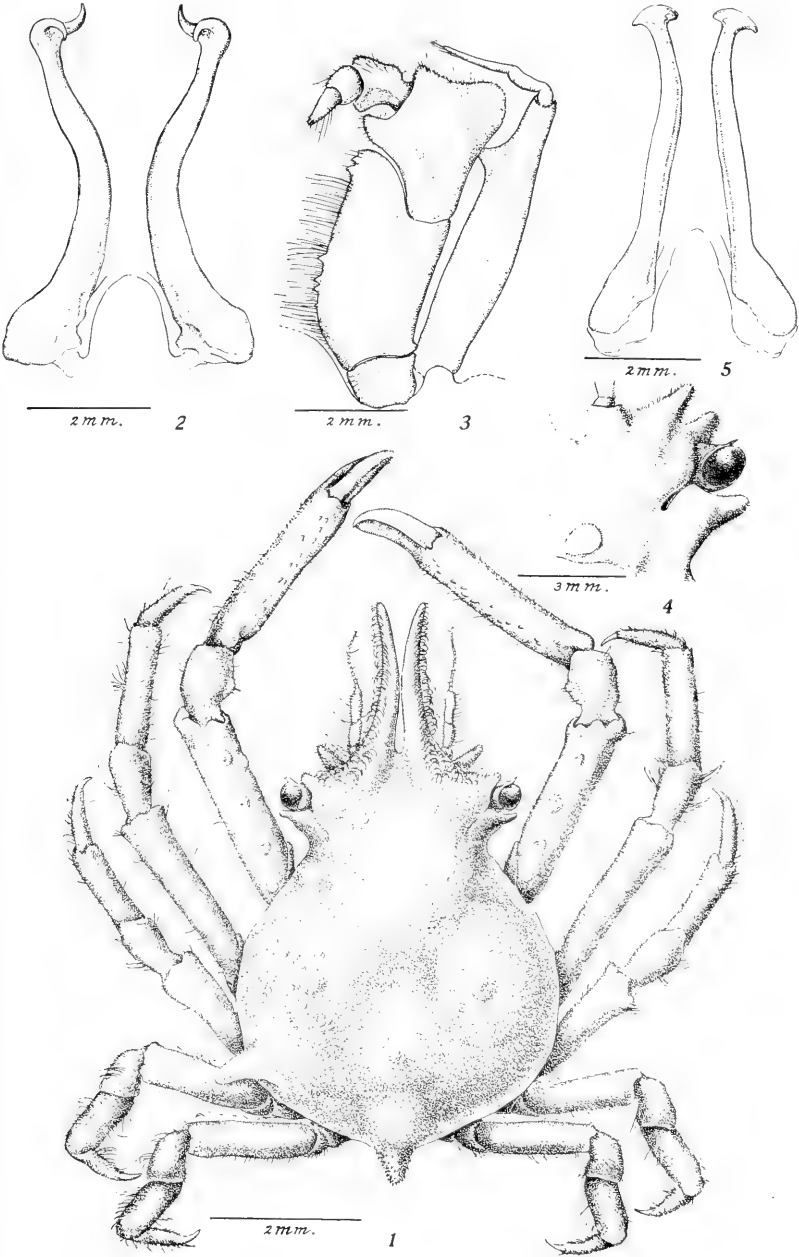
*Macrocoeloma maccullochae*, new species

Male holotype

- Fig. 1. Dorsal view.
- Fig. 2. Male genitalia.
- Fig. 3. Left outer maxilliped.
- Fig. 4. Under side of orbit.

*M. trispinosum* (Latreille)

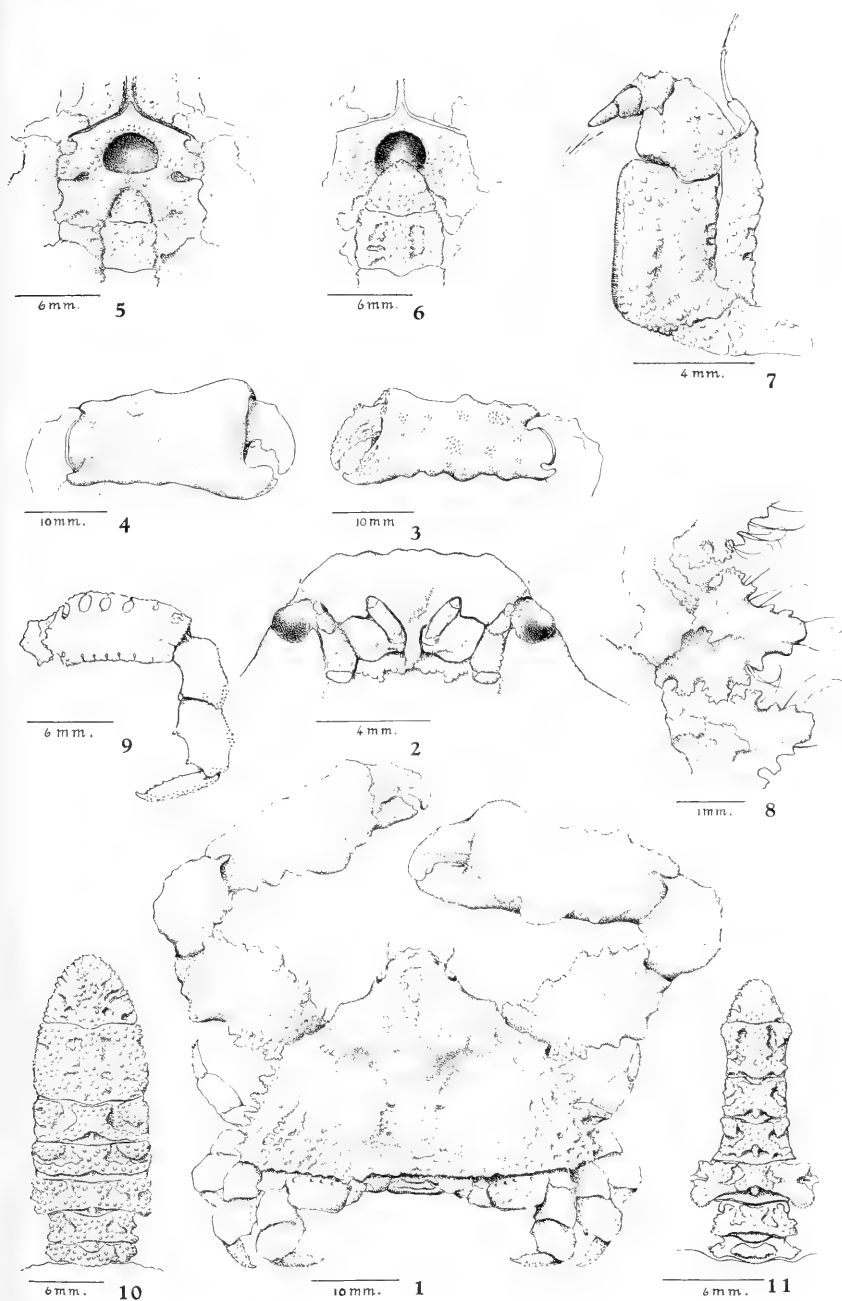
- Fig. 5. Male genitalia.



## PLATE 17

*Daldorfia garthi* Glassell, new species

- Fig. 1. Dorsal view.
- Fig. 2. Frontal view.
- Fig. 3. Minor chela.
- Fig. 4. Major chela.
- Fig. 5. Sternal pit, showing position of male abdomen.
- Fig. 6. Sternal pit, showing position of female abdomen.
- Fig. 7. Left outer maxilliped.
- Fig. 8. Detail of lateral teeth.
- Fig. 9. Right third ambulatory leg.
- Fig. 10. Female abdomen.
- Fig. 11. Male abdomen.



## PLATE 18

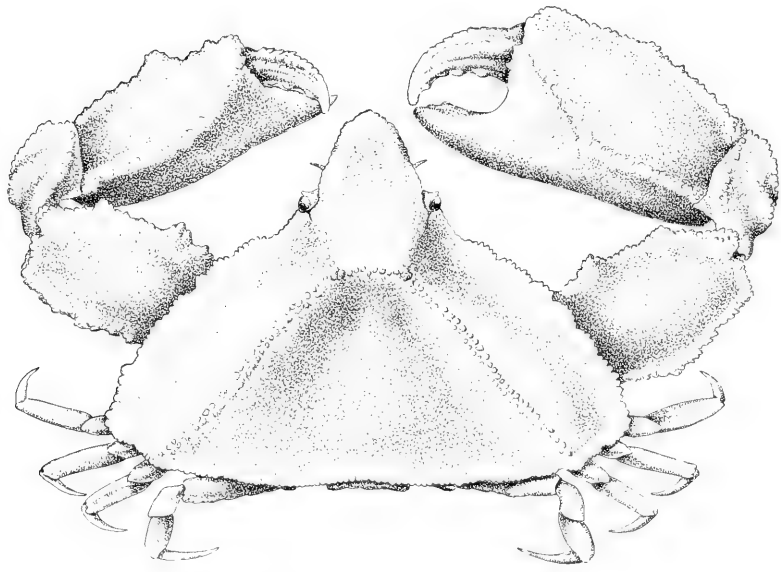
*Heterocrypta colombiana*, new species

Male holotype

Fig. 1. Dorsal view.

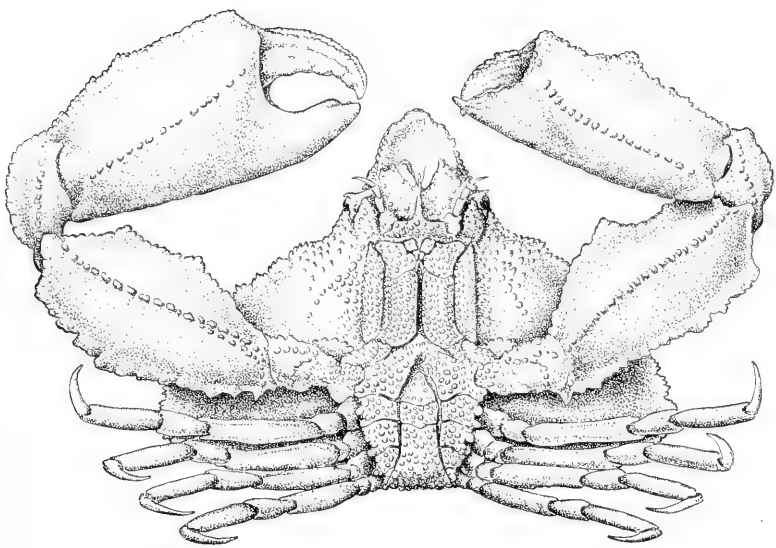
Fig. 2. Ventral view.





3 m m .

1



3 m m .

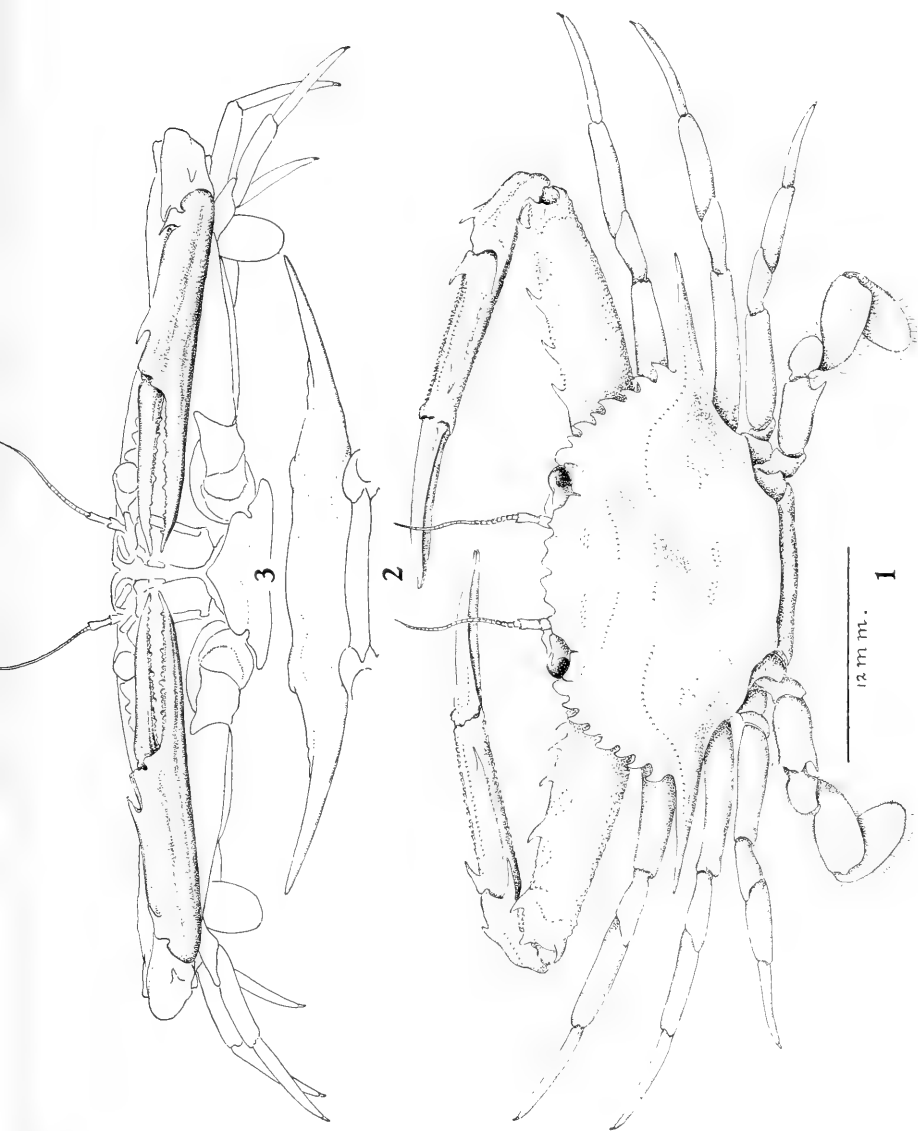
2

## PLATE 19

*Portunus (Portunus) acuminatus* Stimpson

Male neotype

- Fig. 1. Dorsal view.
- Fig. 2. Posterior view of carapace.
- Fig. 3. Frontal view of chelae.

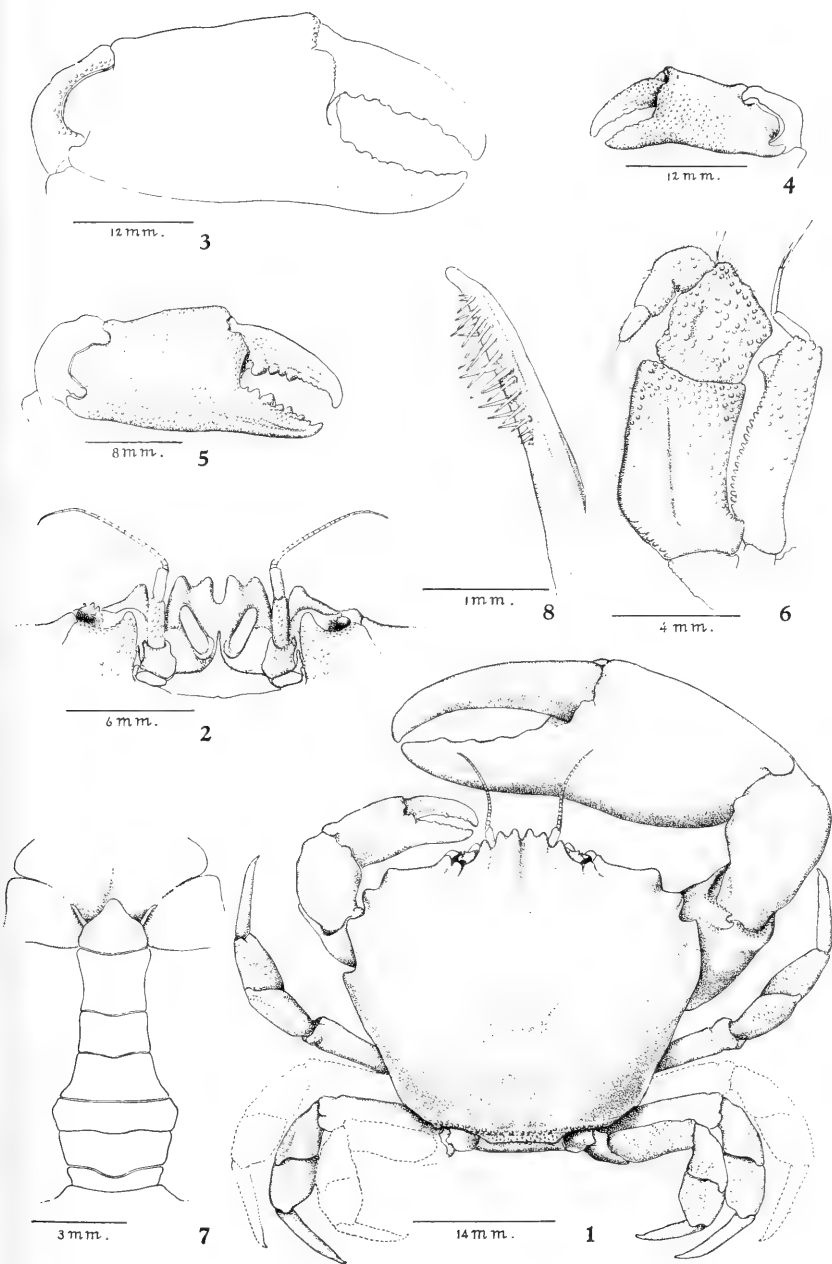


## PLATE 20

*Platyxanthus balboai*, new species

Male allotype

- Fig. 1. Dorsal view.
- Fig. 2. Ventral view of front.
- Fig. 3. Major chela.
- Fig. 4. Minor chela.
- Fig. 5. Major chela, female holotype.
- Fig. 6. Left outer maxilliped.
- Fig. 7. Abdomen, showing protruding  
verges.
- Fig. 8. Tip of abdominal appendage.

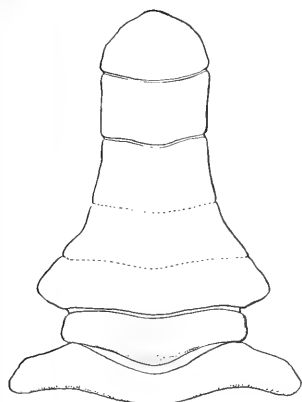


## PLATE 21

*Hexapanopeus costaricensis*, new species

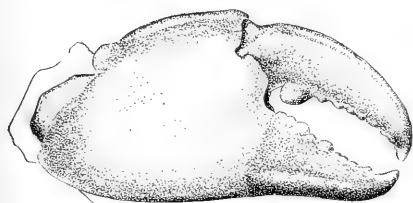
Male holotype

- Fig. 1. Dorsal view.
- Fig. 2. Major chela.
- Fig. 3. Abdomen.
- Fig. 4. Left outer maxilliped.



1 m m.

3

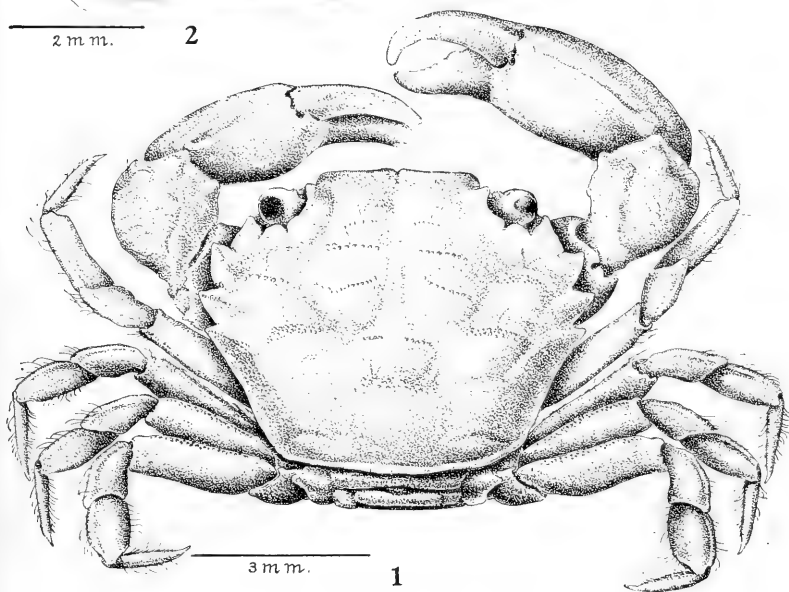


2 m m.

2

 $\frac{1}{2}$  m m.

4



3 m m.

1

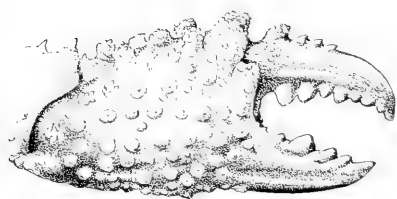
## PLATE 22

*Heteractaea peterseni*, new species

Female holotype

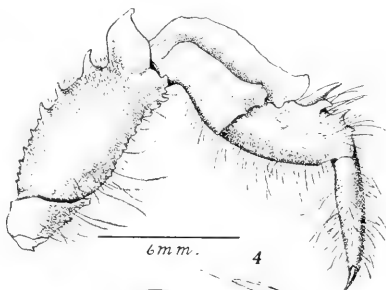
- Fig. 1. Dorsal view.
- Fig. 2. Frontal view.
- Fig. 3. Major chela.
- Fig. 4. Right fourth ambulatory leg.
- Fig. 5. Left outer maxilliped.





6 mm.

3



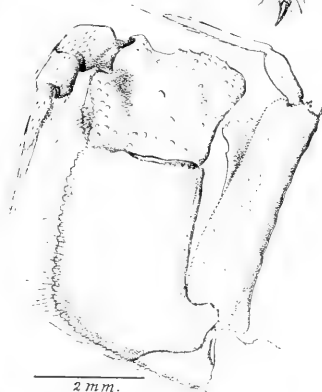
6 mm.

4



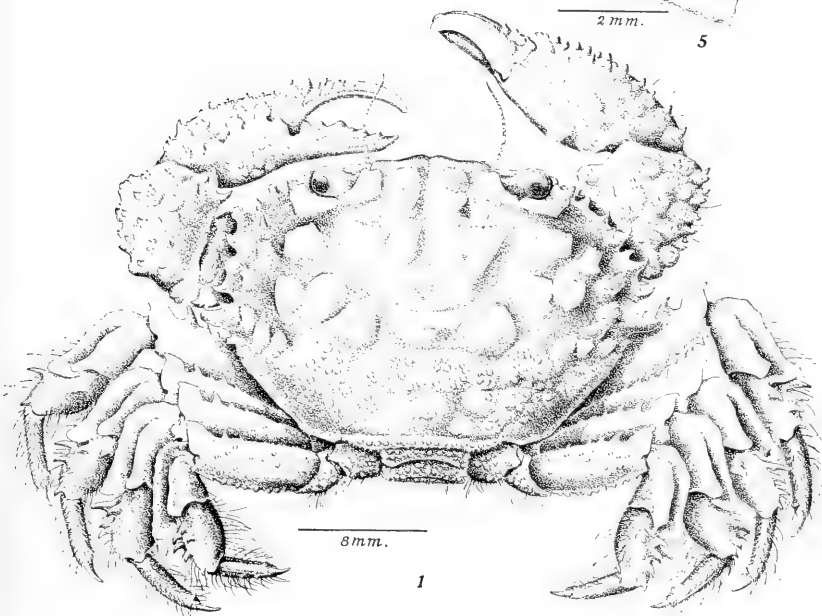
6 mm.

2



2 mm.

5



8 mm.

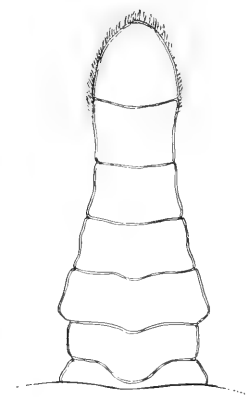
1

## PLATE 23

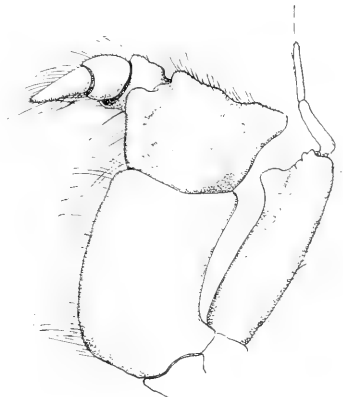
*Pilumnoides rotundus*, new species

Female holotype

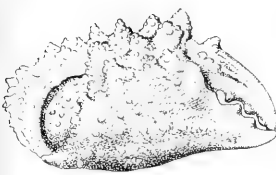
- Fig. 1. Dorsal view.
- Fig. 2. Major chela.
- Fig. 3. Abdomen, male allotype.
- Fig. 4. Left outer maxilliped.
- Fig. 5. Frontal view.



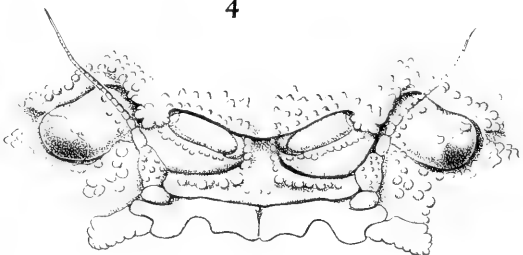
3



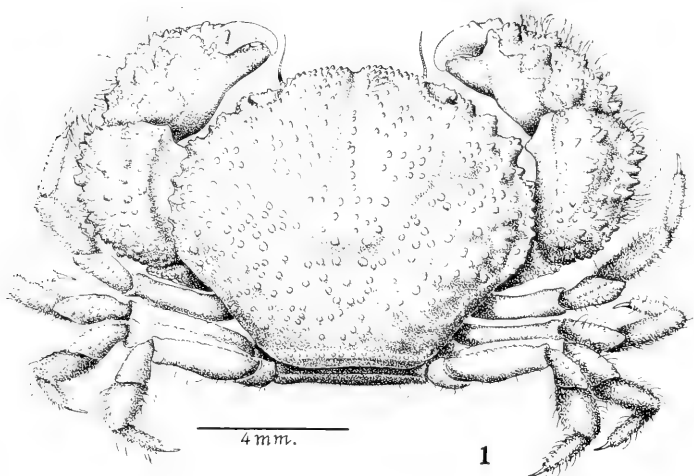
4



2



5



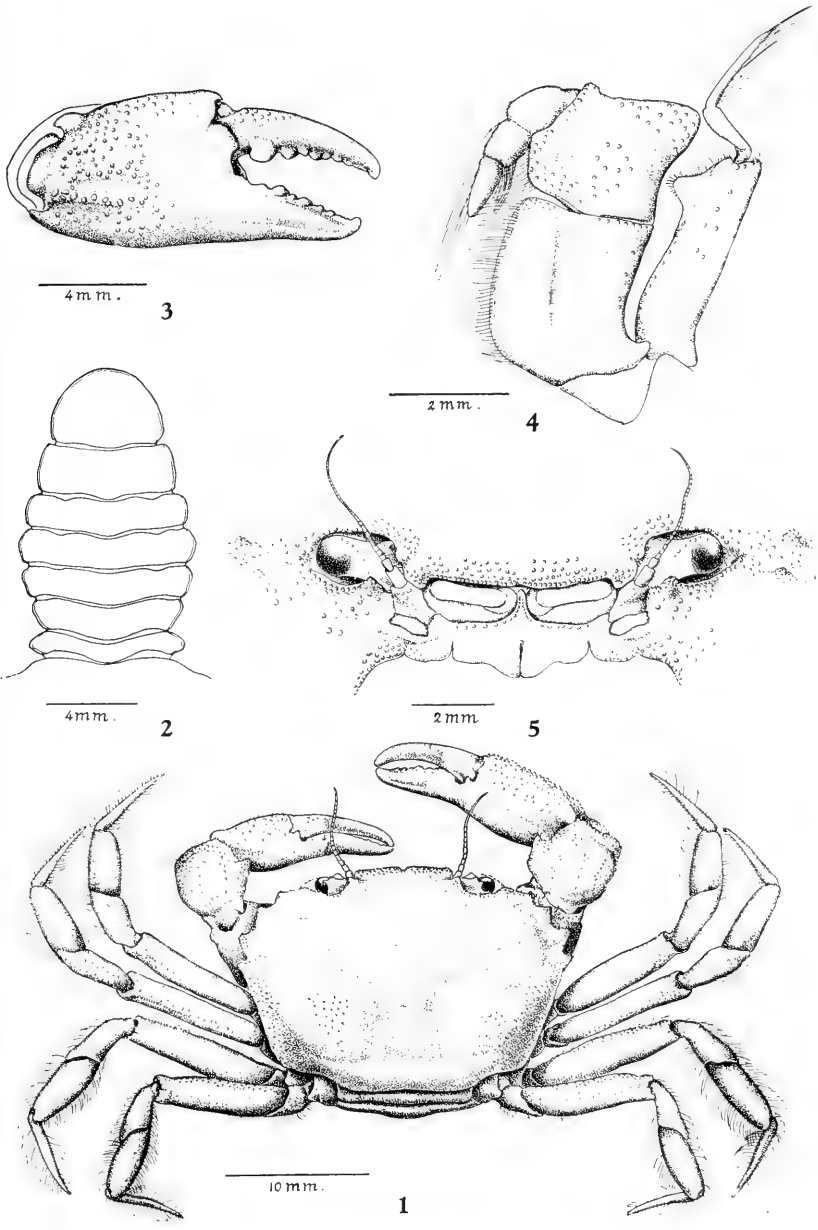
1

## PLATE 24

*Pseudorhombila xanthiformis*, new species

Female holotype

- Fig. 1. Dorsal view.
- Fig. 2. Abdomen.
- Fig. 3. Major chela.
- Fig. 4. Left outer maxilliped.
- Fig. 5. Frontal view.

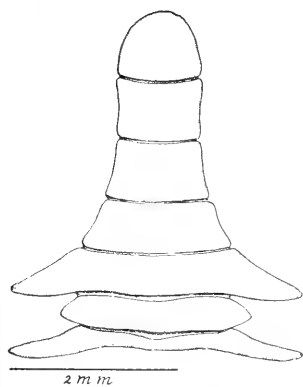


## PLATE 25

*Cyrtoplax panamensis* Ziesenhenné, new species

Male holotype

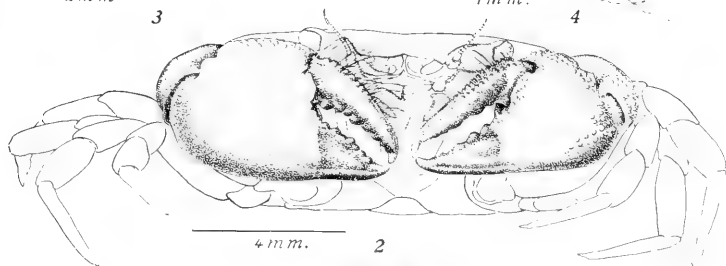
- Fig. 1. Dorsal view.
- Fig. 2. Frontal view.
- Fig. 3. Abdomen.
- Fig. 4. Left outer maxilliped.



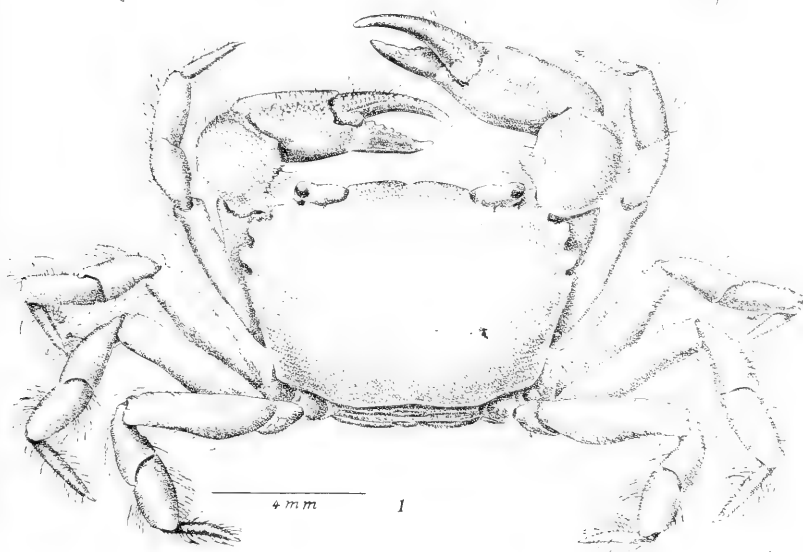
3



4



2



1

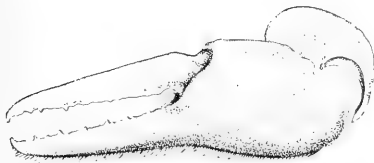
## PLATE 26

*Chasmocarcinus longipes*, new species

Female holotype

- Fig. 1. Dorsal view.
- Fig. 2. Left chela.
- Fig. 3. Major chela, male.
- Fig. 4. Right outer maxilliped.
- Fig. 5. Detail of frontal region.

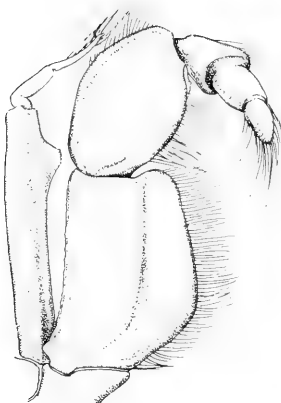




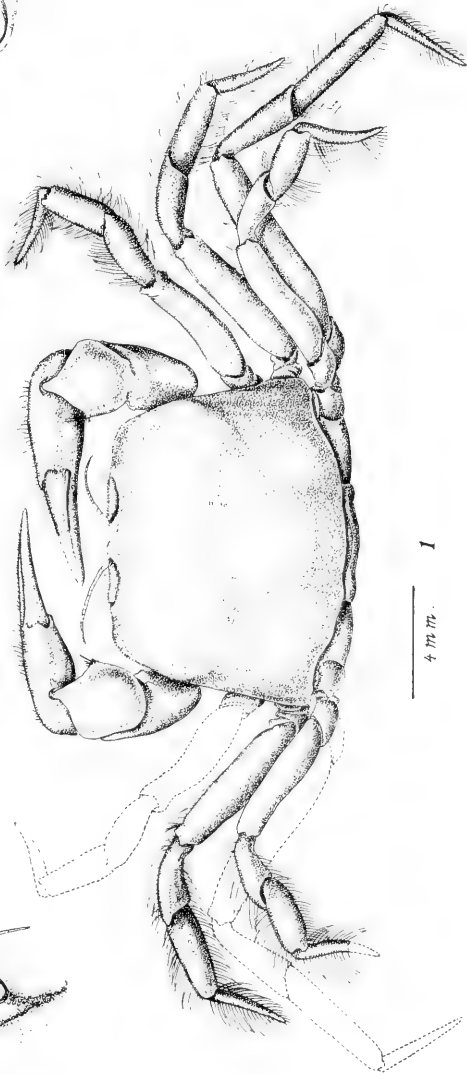
2



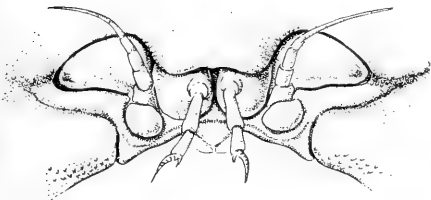
3



4



1



5



REPORTS ON THE COLLECTIONS OBTAINED BY ALLAN HANCOCK PACIFIC EXPEDITIONS OF  
VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA, AND GALA-  
PAGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935, IN 1936, IN 1937, AND IN 1938.

# THE STOMATOPODS OF THE WEST COAST OF AMERICA

Based on Collections Made by the Allan Hancock Expeditions, 1933-38  
(33 TEXT FIGURES)

*By* WALDO L. SCHMITT

THE UNIVERSITY OF SOUTHERN CALIFORNIA PUBLICATIONS

ALLAN HANCOCK PACIFIC EXPEDITIONS

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# THE STOMATOPODS OF THE WEST COAST OF AMERICA<sup>1</sup>

Based on Collections Made by the Allan Hancock Expeditions, 1933-38

(33 TEXT FIGURES)

By WALDO L. SCHMITT

Curator of Marine Invertebrates, U.S. National Museum

## FOREWORD

The stomatopods of the Hancock Expeditions (1933-38) form as interesting a collection of crustacea as ever I have had the pleasure of studying. With a sense of lasting gratitude, I dedicate this paper to Captain Allan Hancock, of Los Angeles and Santa Maria, California, who made possible the expeditions on which these stomatopods were collected and the publication of this report upon them.

## INTRODUCTION

Until now, 5 genera and 17 species<sup>2</sup> of stomatopods had been reported from the Pacific shores of American and adjacent islands. As a result of the investigations of the Hancock Expeditions, it is now possible to add to that number: (a) a genus and species by virtue of the discovery of the rare Atlantic *Coronida bradyi* in the Galapagos Islands, where it seems fairly abundant; (b) a common Indo-west-Pacific stomatopod, *Lysiosquilla maculata*, for the first time taken east of the Hawaiian or Marquesas Islands, at La Libertad, Ecuador; (c) 6 new species and what appears to be a new subspecies of an already known species taken by the Hancock Expeditions; (d) 2 species newly named which are based on formerly merely lettered varieties of an old species; and (e) a seventh new species described from material collected by Dr. S. F. Hildebrand at Panama. This species is introduced here with Captain Hancock's kind permission, in order to render this account of west American stomatopods as complete as possible for the purpose of encouraging and facilitating further studies upon them. To that end, rather complete

<sup>1</sup> Published by permission of the Secretary of the Smithsonian Institution.

<sup>2</sup> Not counting two which in the past have been known only as lettered varieties of *Squilla panamensis* (see *Remarks* under this species, p. 167).

diagnostic keys to genera and species have been prepared, and pertinent bibliographic references, figures wherever possible, and a brief recapitulation of the recorded distribution are given for each species.

The 5 genera and 17 species previously known from eastern Pacific waters are:

I.	SQUILLA . . . . .	p. 139
	1. <i>aculeata</i> Bigelow . . . . .	p. 158
	2. <i>armata</i> H. Milne-Edwards . . . . .	p. 150
	3. <i>biformis</i> Bigelow . . . . .	p. 165
	4. <i>dubia</i> H. Milne-Edwards . . . . .	p. 155
	5. <i>gracilipes</i> Miers . . . . .	p. 151
	6. <i>panamensis</i> Bigelow . . . . .	p. 166
	7. <i>parva</i> Bigelow . . . . .	p. 168
	8. <i>polita</i> Bigelow . . . . .	p. 146
II.	PSEUDOSQUILLA . . . . .	p. 170
	9. <i>lessonii</i> (Guérin) . . . . .	p. 175
	10. <i>oculata</i> (Brullé) . . . . .	p. 173
III.	HEMISQUILLA . . . . .	p. 181
	11. <i>stylifera</i> (H. Milne-Edwards) . . . . .	p. 182
IV.	LYSIOSQUILLA . . . . .	p. 184
	12. <i>decemspinosa</i> Rathbun . . . . .	p. 189
	13. <i>desaussurei</i> Stimpson . . . . .	p. 193
	14. <i>digueti</i> Coutière . . . . .	p. 194
	15. <i>polydactyla</i> von Martens . . . . .	p. 187
V.	GONODACTYLUS . . . . .	p. 208
	16. <i>festae</i> Nobili . . . . .	p. 220
	17. <i>oerstedii</i> Hansen . . . . .	p. 211

The 2 species and one genus here added to the known stomatopod fauna of the eastern Pacific are:

VI.	CORONIDA . . . . .	p. 202
	18. <i>Coronida bradyi</i> (A. Milne-Edwards) . . . . .	p. 202
	19. <i>Lysiosquilla maculata</i> (Fabricius) . . . . .	p. 190

The 2 formerly lettered varieties of *Squilla panamensis* specifically named in this paper are:

20.	<i>Squilla bigelowi</i> (for variety <i>A</i> Bigelow) . . . . .	p. 156
21.	<i>Squilla tiburonensis</i> (for variety <i>B</i> Bigelow) . . . . .	p. 165

The species described as new in this paper are:

22. <i>Squilla hancocki</i> . . . . .	p. 160
23. <i>Squilla hildebrandi</i> . . . . .	p. 152
24. <i>Squilla swetti</i> . . . . .	p. 146
25. <i>Pseudosquilla veleronis</i> . . . . .	p. 176
26. <i>Lysiosquilla mccullochae</i> . . . . .	p. 197
27. <i>Gonodactylus bahiahondensis</i> . . . . .	p. 217
28. <i>Gonodactylus stanschi</i> . . . . .	p. 215

The apparently new subspecies is:

<i>Gonodactylus festae lalibertadensis</i> . . . . .	p. 223
--	--------

The foregoing list comprises 6 genera, 28 species, and one subspecies. All 6 genera, 17 of the species, and the one subspecies are included in the material collected by the Hancock Expeditions.

#### GALAPAGOS STOMATOPODS

Although the fact seems generally to have escaped notice because no one seems ever to have taken the trouble to look up the precise position indicated by Bigelow,<sup>3</sup> he was the first to record stomatopods from the Galapagos Islands, 3 specimens of *Pseudosquilla lessonii*. These were townetted about 10 miles approximately N.W. of Wreck Point, Chatham Island, April 15, 1888.

Including *Pseudosquilla lessonii*, which ranges from southern California to Chile, the Hancock Expeditions have so far been able to turn up but 4 species of stomatopods from the waters of the archipelago. The other 3 are: (1) *Pseudosquilla oculata*, a widely distributed species found in the Atlantic as well as in the central and west Pacific, and now, as the result of Captain Hancock's efforts, on the coasts of Panama and Colombia, and adjacent islands; (2) *Gonodactylus oerstedii*, common in the south temperate and tropical west Atlantic and in the temperate and tropical eastern Pacific from La Plata Island, Ecuador, and the Galapagos northward into the Gulf of California; (3) *Coronida bradyi*, a most unexpected discovery. This rare Atlantic form, at least in the adult stage, has heretofore been known from only 5 specimens from the Cape Verde Islands, from which it was described, and one

<sup>3</sup> *Albatross* "Surface station 29 in S. Lat. 00° 46' 00", and W. Long. 89° 42' 00"." Proc. U.S. Nat. Mus., Vol. 17, p. 502, 1894.

other from the Spanish island of Annobon (Anno Bom) in the Gulf of Guinea.

The discovery of *C. bradyi* in the Galapagos is closely paralleled by that of the hydroid, *Streptocaulus pulcherrimus* Allman, in the same archipelago by Fraser in the course of the same Hancock Expedition, 1934. The type locality of the hydroid, like that of the stomatopod, lies in the Cape Verde Islands. This coincidental distribution has also been referred to on page 202 under *C. bradyi*.

#### ZOOGEOGRAPHIC NOTES<sup>4</sup>

Twenty-one (+ one subspecies) of the 28 (+ one subspecies) species of stomatopods recorded from the eastern Pacific are known from that region only.<sup>5</sup>

Of the remaining 7 species: 3, *Squilla armata*, *Pseudosquilla oculata*, and *Lysiosquilla maculata*,<sup>6</sup> occur in the Atlantic, as well as in the Indo-Pacific (Indo-west-Pacific, Ekman<sup>7</sup>); 3 others, *Squilla dubia*, *Coronida bradyi*, and *Gonodactylus oerstedii*, are found in the Atlantic but not in the Indo-Pacific; and one, *Hemisquilla styliifera*, is otherwise found in the Indo-Pacific from New South Wales, Australia, only.<sup>8</sup>

In his discussion of *Gonodactylus oerstedii* and its varieties, Bigelow<sup>9</sup> states, "It is not surprising to find the same species of similar forms with slight differences on the two sides of the Isthmus of Panama, a land barrier that arose during the upper Miocene Period.<sup>10</sup> Similar results were obtained from the study of the species of *Squilla* (Bigelow, 1894<sup>11</sup>). *Squilla intermedia* is an Atlantic form, and two closely related species, *S. panamensis* and *S. biformis*, are probably entirely confined to the Pacific Coast of America (cf. Calman, 1917, p. 140<sup>12</sup>). The wide stretch

<sup>4</sup> See also Balss, Bronns Klassen und Ordnungen des Tierreichs, Vol. 5, Abt. 1, Book 6, Pt. 2, Stomatopoda, p. 127, 1938.

<sup>5</sup> The 28 (+ one subspecies) species are enumerated on pages 130-131.

<sup>6</sup> The occurrence of the species proper in the Atlantic should be corroborated; however, the variety *sulcirostris* is reported by Monod (see p. 192).

<sup>7</sup> Tiergeographie des Meeres, pp. xii + 542, Leipzig, 1935.

<sup>8</sup> There is also an old, but as yet uncorroborated, record of this species from the Hawaiian Islands.

<sup>9</sup> Bull. Mus. Comp. Zool., Vol. 72, No. 4, p. 122, 1931.

<sup>10</sup> "There may have been a narrow connection between the Atlantic and the Gulf of California during the Pliocene." Vaughan, U.S. Nat. Mus. Bull. 103, p. 611, 1919.

<sup>11</sup> Proc. U.S. Nat. Mus., Vol. 17, No. 1017, pp. 509-543.

<sup>12</sup> Brit. Antarct. ("Terra Nova") Exped., Nat. Hist. Rep., Zool., Vol. 3, No. 5, 1910.



of the open sea between the archipelagoes of the southern Pacific and the shores of America seems to be a more efficient barrier than a comparatively recent land mass like the Isthmus of Panama. Thus, we have *G. chiragra* and its variety *platysoma* occupying a wide area in the Indo-Pacific region, but unknown in Hawaii and on the shores of the American Continent. In the same way, *G. oerstedii* and its varieties *festae*<sup>13</sup> and *spinulosus* occupy similar stations in the western Atlantic, West Indies, and Pacific shores of tropical America."

Ekman<sup>14</sup> and Balss<sup>15</sup> are wholly in accord with this view, which seems to have the weight of evidence in its favor. As noted above, there are 3 eastern Pacific stomatopods that are also found in the Atlantic and not in the Indo-Pacific, and only one<sup>16</sup> found in the Indo-Pacific that is not found in the Atlantic.

Balss gives the following list of comparable, closely related, yet not identical species from the Pacific and Atlantic sides of America, remarking also that Hansen (see *Remarks* on p. 193) holds that *Lysiosquilla desaussurei* from the west coast of Mexico and *L. scabricauda* from the West Indies are identical:

<i>Pacific</i>	<i>Atlantic</i>
<i>Squilla panamensis</i> Bigelow <sup>17</sup>	<i>S. brasiliensis</i> Calman
<i>Squilla aculeata</i> Bigelow	<i>S. empusa</i> Say
<i>Squilla polita</i> Bigelow	<i>S. quadridens</i> Bigelow
<i>Lysiosquilla decemspinosa</i> Rathbun	<i>L. armata</i> Smith

"On the other hand," says Balss, "the relationships of the West American to the Indo-Pacific fauna are not very pronounced, due to

<sup>13</sup> The fact that *G. festae* has been restored to full specific rank in this paper in no wise alters Dr. Bigelow's argument. There are spiny or spinulose forms of the *G. oerstedii* complex on both sides of America: *G. oerstedii* var. *spinulosus* (Schmitt, Univ. Iowa Studies Nat. Hist., Vol. 10, p. 96, pl. 5, fig. 5, 1924) and var. *curacaoensis* (Schmitt, Bijdr. Dierkunde, Amsterdam, Vol. 23, p. 80, pl. 8, fig. 6, 1924) in the Atlantic, and *G. bahiahondensis*, *G. festae* and its subspecies, *lallibertadensis*, and *G. stanschi* in the Pacific, to say nothing of the Pacific and Atlantic forms of *G. oerstedii* proper which show some differences not yet deemed constant enough or sharply enough drawn to warrant definite taxonomic distinction.

<sup>14</sup> Tiergeographie des Meeres, p. 56, 1935.

<sup>15</sup> Bronns Klassen und Ordnungen des Tierreichs, Vol. 5, Abt. 1, Book 6, pt. 2, Stomatopoda, p. 141, 1938.

<sup>16</sup> *Hemisquilla styliifera*; the Indo-Pacific (Australia only) representatives may yet prove to be different; in the Atlantic there is for this species the closely related (analogous species) *H. braziliensis* (Moreira).

<sup>17</sup> See also Bigelow's quoted remarks on the "species of *Squilla*" above, p. 132.

the general zoogeographic position of the American west coast (cf. Ekman, 1935). *Lysiosquilla digueti* Cout. from the Gulf of California has as its nearest relative *L. vicina* Nobili from the Red Sea and the Philippines. *Pseudosquilla lessonii* Guérin (Chile to California) is related to *P. dofleini* Balss from Japan and *Hemisquilla styliifera* (H.M.-Edw.) (Chile to California) has otherwise been found only in New South Wales."

The stomatopods described as new or which have been given new names in this paper fit comfortably into such a distribution pattern. There can be no question regarding the Atlantic affinities of the several *Gonodactylus* forms, *G. bahiahondensis*, *G. festae lalibertadensis*, and *G. stanschi*; or of *Squilla bigelowi*, *S. hancocki*, and *S. tiburonensis*. The Indo-Pacific ties of *Lysiosquilla maccullochae* to *L. latifrons* (Japan, Australia, New Zealand), of *Pseudosquilla veleronis* to *P. pilaensis* (China, Indian Ocean, Red Sea), and of *Squilla swetti* to *S. fasciata* (Japan, China, and Indian Ocean) or *S. miles* (Australia), are very much less significant, and therefore throw into all the more striking relief the near identity of *Squilla hildebrandi* from Panama to *S. hieroglyphica* which, although without definite locality, is most assuredly of Indo-Pacific origin.<sup>18</sup>

Whether *Squilla hildebrandi* is a relict, or has evolved from a relict of a formerly widespread Pacific fauna, or is the descendant of a member of a drift fauna transported to the shores of America by some current similar to or stronger than the relatively weak Pacific equatorial countercurrent, is impossible to say. Of more than passing interest in this connection was the discovery of the Indo-Pacific coral gall crab, *Hapalocarcinus marsupialis*, at Port Utria, Colombia, and in the Secas Islands, Panama, by the Hancock Expedition of 1935,<sup>19</sup> and that of the first *Thalamita* from the Western Hemisphere, *T. roosevelti*, at Clipperton Island during the Presidential Cruise of 1938.<sup>20</sup> At the same time, at Clipperton Island, I also found a terrestrial amphipod almost specifically identical with one described from the Marquesas Islands. A number of Polynesian mollusks, or near relatives of such shells, have been reported

<sup>18</sup> *S. hieroglyphica* in turn is closely related to *S. laevis* Hess from Australia (Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 49, pl. 3, figs. 35-37, 1913). The other Indo-Pacific species mentioned are also to be found in Kemp.

<sup>19</sup> Exploration and Field-work of the Smithsonian Inst. in 1935, p. 34, fig. 36, 1936, and Rathbun, Bull. U.S. Nat. Mus., No. 166, p. 259, pl. 79, figs. 3-9, 1937.

<sup>20</sup> Smithsonian Misc. Coll., Vol. 98, No. 6, p. 16, fig. 2, 1939.

from eastern Pacific waters by Hertlein<sup>21</sup> and by Bartsch and Rehder,<sup>22</sup> as well as at least one echinoderm of similar significance by Austin H. Clark.<sup>23</sup>

#### EXPLANATIONS AND ACKNOWLEDGMENTS

All stomatopods in the Hancock collections, 1933-1938, are here reported upon with the exception of larval specimens and juveniles too young for satisfactory specific determination.

Indispensable to any stomatopod study is Kemp's "Account of the Crustacea Stomatopoda of the Indo-Pacific Region based on the Collection in the Indian Museum," Mem. Indian Mus., Vol. 4, No. 1, 1913. Equally useful to any student of the west coast forms is Bigelow's "Report upon the Crustacea of the Order Stomatopoda collected by the Steamer Albatross between 1885 and 1891, and on other Specimens in the U.S. National Museum," Proc. U.S. Nat. Mus., Vol. 17, No. 1017, 1894.

In the synonymy under each species, in addition to the citation of the original description, reference has been made to both Kemp and Bigelow wherever possible, along with other pertinent papers, and any that have come to my attention since Kemp's monograph was published.

In place of the diagnoses usually given, especially for new species, in taxonomic works of this sort, rather detailed keys to the west coast species have been introduced for the purpose of facilitating identification. Many keys, striving for conciseness, become altogether too brief. I hope I have not erred in the other direction. The added information, printed in smaller, eight-point type, was found very useful in the more careful comparison of closely related species, and may again prove so to those who may have occasion to use this paper. In all instances the terminal tooth or spine of the raptorial dactylus has been included in the count of the teeth arming its inner margin.

Notes on color, unless otherwise stated, are based on alcoholically preserved specimens. These notes chiefly concern color markings that have proved to be more or less permanent and which, therefore, may be of some use in the recognition of certain species. This is especially true of a number of the *Squilla* species, including specimens of some described by Bigelow nearly half a century ago. On the other hand, color, as a

<sup>21</sup> Proc. Amer. Philos. Soc., Vol. 78, pp. 303-312, pl. 1 and map, 1938.

<sup>22</sup> Smithsonian Misc. Coll., Vol. 98, No. 10, pp. 1-18, pls. 1-5, 1939.

<sup>23</sup> Smithsonian Misc. Coll., Vol. 98, No. 11, pp. 1-18, pls. 1-5, 1939.

general rule, does not seem to be specifically linked in the *Gonodactylus* forms, although I have found very characteristic markings in an Atlantic variety of *G. oerstedii*.<sup>24</sup>

The drawings illustrating this paper, unless otherwise credited, are the work of Miss Jane Roller, with the exception of figures 10*d*, 17*b*, 17*c*, 19, 21, and 24, which were made by Mr. Andrew Pizzini. Miss Roller has also checked the drawings against the text and the legends accompanying the figures, and has usefully assisted me in other ways.

The magnification of the illustrations may be derived from a line one millimeter in length that has been drawn beside each figure.

<sup>24</sup> *G. o.* var. *spinulosus*, Schmitt, Univ. Iowa Studies in Nat. Hist., Vol. 10, No. 4, pp. 96-98, 1924.

## SYSTEMATIC DISCUSSION

## Order STOMATOPODA

## Family Squillidae

Key to the Genera of Stomatopods Known from the  
West Coast of America<sup>25</sup>

- A<sup>1</sup>.** Articulation between the merus and ischium<sup>26</sup> of the raptorial claw terminal (normal); merus grooved inferiorly for the reception of the propodus throughout its length; propodus finely pectinate, or with a series of fixed spines along outer margin of dorsal surface; dactylus not inflated at base, except in the one genus *Coronida*.
- B<sup>1</sup>.** Carapace with well-marked carinae; cervical groove defined across dorsum of carapace; first 5 abdominal somites with longitudinal carinae; raptorial dactylus armed with teeth on inner margin. . . . . *Squilla*, p. 139
- B<sup>2</sup>.** Carapace without carinae;<sup>27</sup> cervical groove not extending across dorsum of carapace;<sup>27</sup> first 5 abdominal somites without longitudinal carinae.<sup>27</sup>

<sup>25</sup> This key is largely that of Kemp (Mem. Indian Mus., Vol. 4, No. 1, p. 16, 1913). Only two of the known genera of stomatopods do not appear in the key here given, *Coronidopsis* and *Odontodactylus*.

The former is known only from the unique type, *C. bicuspis* Hansen (Siboga Exped., Monog. 35, Lief. 105, p. 19, pl. 1, fig. 7a-g, 1926), 43 mm. in length, from Buton Strait, between Celebes and Flores, Dutch East Indies. Classified near *Coronida*, it is at once distinguished by "its remarkable rostral plate which is anteriorly divided by a rather deep incision into two long, acute teeth." The raptorial dactylus is not inflated at the base, and is armed with four teeth, including the terminal one.

*Odontodactylus* (see Kemp, Mem. Indian Mus., Vol. 4, No. 1, pp. 133 and 204, 1913) is known from several species from the Indo-west-Pacific and one from the Atlantic. This genus stands close to *Gonodactylus* and, if found on the west coast of America, it would have appeared in the following key in Section A<sup>2</sup> along with *Gonodactylus*. Unlike *Gonodactylus*, the raptorial dactylus is armed with teeth on its inner margin. As in that genus, the raptorial dactylus is inflated at the base.

<sup>26</sup> This articulation is given by some authors (see Balss, Bronns Klassen und Ordnungen des Tierreichs, Vol. 5, Abt. 1, Book 6, Pt. 2, Stomatopoda, p. 21, 1938) as between the basis and the ischiomerus, the question being whether the basis is wanting, as Kemp believes, or whether the basis is present and the ischium and merus fused to account for the 6-jointed thoracic legs of stomatopods as compared with the 7-jointed ones of other Malacostraca.

<sup>27</sup> Except in the Mediterranean *Pseudosquilla ferussaci* (Giesbrecht, Fauna u. Flora d. Golfes v. Neapel, Monog. 33, Stomatopoden, p. 34, pl. 4, figs. 37-48, 1910). Kemp states, "It seems to combine the telson of a *Pseudosquilla* with many of the characteristic features of *Squilla*, but is perhaps rather more nearly allied to the former genus than to the latter."

- C<sup>1</sup>.** Abdomen usually compressed, rarely noticeably flattened (as in *Pseudosquilla veleronis*); telson with a well-marked, usually sharp, median carina, and (in adults) usually with one or more additional carinae either side; submedian teeth with movable tips or spines; no submedian denticles (at least in adults).
- D<sup>1</sup>.** Raptorial dactylus armed with teeth; usually with 3 or 4, counting the terminal one, sometimes with as many as 7 or 8 (*P. veleronis*). . . . *Pseudosquilla*, p. 170
- D<sup>2</sup>.** Raptorial dactylus unarmed except for terminal tooth. . . . *Hemisquilla*, p. 181
- C<sup>2</sup>.** Abdomen depressed, noticeably flattened; telson without true or definite median carina; submedian denticles may or may not be present, present in most species.
- D<sup>1</sup>.** Raptorial dactylus as in preceding genera, not inflated at base; armed with 4 or more teeth, including the terminal one; telson smooth or scabrous and without submedian spinules or denticles, or with a transverse row or circlet of spines and submedian spinules or denticles on its posterior margin. . . . *Lysiosquilla*, p. 184
- D<sup>2</sup>.** Raptorial dactylus inflated at base; armed with not more than 4 teeth, including terminal one;<sup>28</sup> telson closely studded with small spines or fine spinules, or large tubercles; with or without a pair of submedian carinae. . . . *Coronida*, p. 202
- A<sup>2</sup>.** Ischiomerall articulation of raptorial claw situated at a point anterior to proximal end of merus, which consequently extends backward considerably beyond the joint; ventral surface of merus grooved and hollowed out for reception of propodus for not more than  $\frac{3}{4}$  its length; raptorial dactylus inflated at base and unarmed except for terminal tooth. . . . *Gonodactylus*, p. 208

<sup>28</sup> In the 17 mm. long, unique specimen of *Coronida sinuosa* Edmondson (Occ. Paps. Bishop Mus., Vol. 7, No. 13, p. 295 [17], fig. 2, 1921), one raptorial dactylus is armed with 4 teeth, including the terminal one, the other with 5. Its placement in *Coronida* should at best be considered only tentative, for, as Dr. Edmondson himself comments, "There is no certainty that the individual described is mature." The telson is not spined or tuberculated; its dorsal surface is "marked by numerous linear, curved, and scroll-like carinae which lack symmetry on the two sides except in the medial region, where it is maintained in a slight degree."

Genus *SQUILLA* Fabricius, 1787

In view of Dr. B. Chopra's<sup>29</sup> discussion of the use of the name *Squilla* for this genus and his discovery that *Clorida* Eydoux and Souleyet<sup>30</sup> and not *Chloridella* Miers<sup>31</sup> would have to be adopted if the International rules of Zoological Nomenclature are to be strictly adhered to, I have been moved to recede from the stand which was taken by Dr. Mary J. Rathbun<sup>32</sup> in favor of *Chloridella* and which I have strongly supported in the past.

Moreover, Dr. Charles Wardell Stiles, formerly Secretary of the International Commission for Zoological Nomenclature, with whom I again went over the entire matter a few months ago, has a memorandum from Dr. Rathbun, written in response to his request for her opinion on Dr. Bigelow's<sup>33</sup> petition for a suspension of the Rules in behalf of *Squilla*. She expressed her approval of it.

In literature, correspondence, and conversation, by far the greater number of carcinologists are strongly in favor of a suspension of the Rules and the retention of *Squilla*. At the next meeting of the International Commission the petition will undoubtedly be favorably acted upon, and so, in the interest of uniformity in stomatopod literature, I shall in this paper and future ones give *Squilla* precedence, until such time as the Commission may rule otherwise.

We do not yet know our stomatopods well enough always to determine young, or small, and immature specimens. The adult, mature characters upon which the following keys and descriptions of species are chiefly based are to be found only in specimens of fair or good size for the species. Specimens less than 40 mm. in length and sometimes even larger individuals present difficulties: the lateral processes of the free thoracic somites are rarely sufficiently well developed for satisfactory specific determination, especially in forms which have spinous or at least acutely angled processes in the adult; the expected posterior spines of the submedian carinae of certain of the abdominal somites may also be yet

<sup>29</sup> Rec. Indian Mus., Vol. 36, Pt. 1, p. 18, 1934. See also Balss, Bronns Klassen und Ordnungen des Tierreichs, Vol. 5, Abt. 1, Book 6, Pt. 2, Stomatopoda, p. 127, 1938.

<sup>30</sup> Voyage autour du Monde sur *La Bonite*, Zool., 1, Crust., p. 264, 1841.

<sup>31</sup> Ann. Mag. Nat. Hist. (5), Vol. 5, p. 12, 1880.

<sup>32</sup> Proc. U.S. Nat. Mus., Vol. 26, p. 54, 1903.

<sup>33</sup> Bull. Mus. Comp. Zool., Vol. 72, No. 4, pp. 175-177, 1931. See also Stiles, Science, Vol. 83, No. 2162, p. 552, 1936; Zool. Anz., Vol. 115 (3/4), p. 110, 1936.

unformed in the young of certain species; and, likewise, the spines of the anterolateral angles of the carapace in the young of species in which they are normally spined in fully developed or mature specimens may appear blunt or merely rounded off in juvenile specimens.

The characteristic coloration of the uropods in small *Squillas* is not always well developed or so complete as in adults.

### Key to Species of *Squilla* Known from the Pacific Coast of America

- A<sup>1</sup>.** No median carina on carapace anterior to level of cervical groove; no intermediate carinae; and laterals, if present, placed well back on carapace, often inconspicuous.

Lateral margins of 6th and 7th thoracic somites not bilobed. Submedian carinae present on 6th abdominal somite, posteriorly spined. No mandibular palp. Epipodites on first 4 thoracic limbs only (for *S. gracilipes* the count is not known). Telson without trace of pre- (or second) lateral lobe or angle.

- B<sup>1</sup>.** Raptorial dactylus with 4 teeth or spines, counting the terminal one.

Cornea placed obliquely on eyestalk. Lateral margins of 6th and 7th thoracic somites rounded. No submedian carinae on somites anterior to 6th abdominal.

- C<sup>1</sup>.** Lateral process of 5th (first free) thoracic somite a prominent, flattened spine or lobe distally more or less rounded off or subacute, with apex directed forward or laterally; a pair of ventral spines also present.

Anterolateral angles of carapace spined. Telson without carinae either side of median one except marginals. Denticles 6, 8-14, 1, all very sharp, spiniform. . . . . *polita*, p. 146

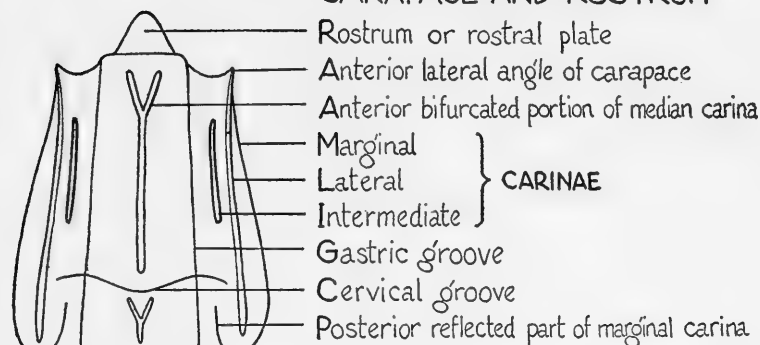
- C<sup>2</sup>.** Lateral margin of 5th thoracic somite in dorsal view appears bilobed, neither lobe forming a conspicuous lateral process: a pair of ventral spines or sharp angles present.

Anterolateral angles of carapace unarmed. Telson with 5 more or less complete longitudinal carinae either side of median one. Denticles 4-5, 9-11, 1. . . . . *sawetti*, p. 146

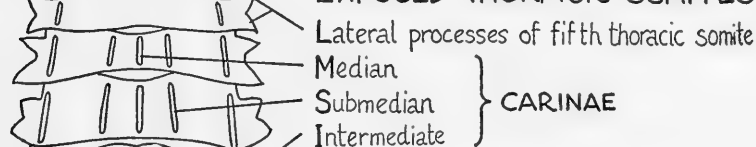
Fig. 1. Diagrammatic sketches of *Squilla*, illustrating terms used in description. *a.* carapace and rostrum, exposed thoracic somites, and first abdominal somite; *b.* 5th and 6th abdominal somites and telson.



## CARAPACE AND ROSTRUM



## EXPOSED THORACIC SOMITES

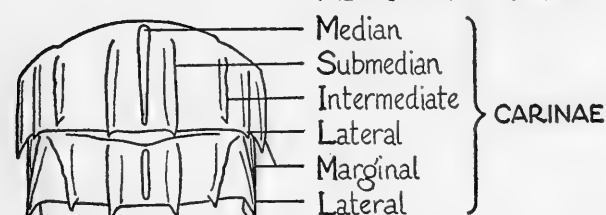


## FIRST ABDOMINAL SOMITE

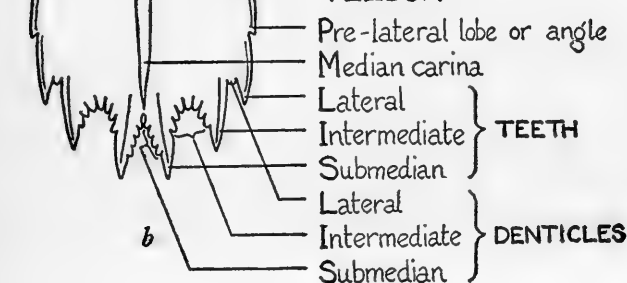


a

## FIFTH AND SIXTH ABDOMINAL SOMITES



## TELSON



b

**B<sup>2</sup>. Raptorial dactylus with more than 4 teeth.**

Anterolateral angles of carapace spined or at least sharp angled. Lateral process of 5th thoracic somite a sharp, laterally directed spine; also a pair of ventral spines.

**C<sup>1</sup>. Cornea set very obliquely on eyestalk.**

Raptorial dactylus with 7 to 9, rarely 6, teeth. Lateral margins of 6th and 7th thoracic somites drawn out at posterolateral angle into a sharp, backwardly directed spine. Submedian carinae present on all abdominal somites, posterior margin of 5th somite either side between submedian and intermediate carinae armed with from 1-4 spines grouped together (found only in this species). Denticles 0, 1-11, 1. Submedian teeth of telson with movable tips. . . . .  
 . . . . . *armata*, p. 150

**C<sup>2</sup>. Cornea set more or less transversely on eyestalk.**

Raptorial dactylus with 8 to 10 teeth. Lateral margins of 6th and 7th thoracic somites rounded. No submedian carinae on somites anterior to 6th abdominal. Denticles 18±, 13±, 1. . . . .  
 . . . . . *gracilipes*, p. 151

**A<sup>2</sup>. Carapace with well-marked median carina; intermediate and lateral carinae present; anterolateral angles spined, at least in larger, adult or mature specimens.**

Submedian carinae present on all abdominal somites. Prelateral lobes or angles of telson at least indicated, usually well marked, spined or unarmed.

**B<sup>1</sup>. Lateral margin of 5th (first free) thoracic somite, seen in dorsal view, composed of 2 prominent, distinct processes, a more or less antrorse anterior spine and a rounded posterior lobe, no ventral spines, lateral margin of 6th and 7th somites rounded, entire, not bilobed.**

Cornea set more or less transversely on eyestalk. Raptorial dactylus with 5 teeth. No trace of mandibular palp. Epipodites on the first 4 thoracic limbs. Submedian carinae on 5th and 6th abdominal somites posteriorly spined. Denticles 3, 10, 1. . . . . *hildebrandi*, p. 152

**B<sup>2</sup>. Lateral margin of 5th thoracic somite, seen in dorsal view, composed of a single process, spinous or subacute, or of one or two low, inconspicuous lobes; also a pair of ventral spines scarcely or not visible in dorsal view.**

Mandibular palp present, except, in some cases at least, in small specimens.

- C<sup>1</sup>.** Eyestalks dilated, bottle or flask shaped, distally constricted before cornea; cornea set more or less obliquely on eyestalk, major axis of cornea shorter than the peduncular one extended to anterior margin of cornea.

Raptorial dactylus with 5 or 6 teeth. Median carina of carapace not bifurcate, intermediate carinae fall well short of anterior margin. Lateral process of 5th thoracic somite a sharp spine to side, slightly inclined forward, lateral margins of 6th and 7th angled and medially emarginated, suggestively but not definitely bilobed. Epipodites on first 3 thoracic limbs. Prelateral lobe or angle of telson not spined. Denticles 1-3, 3-4, 1. . . *dubia*, p. 155

- C<sup>2</sup>.** Eyestalks triangular or subtriangular, widest distally next to cornea, corneal axis at least as long as, usually longer than, peduncular axis.

Raptorial dactylus with 6 teeth. Lateral margins of 6th and 7th (at least 6th) thoracic somites usually more or less distinctly bilobed.

- D<sup>1</sup>.** Prelateral lobe or angle of telson present and spined.

Submedian carinae of 5th and 6th abdominal somites, and usually also 4th in all specimens exceeding 65 mm. in median length exclusive of rostrum and occasional smaller ones, posteriorly spined. Median carina of carapace bifurcate anteriorly and if bifurcate posteriorly before the cervical groove only inconspicuously or incompletely so; intermediate carinae run to or about to anterior margin. Lateral spine of 5th thoracic somite stout, markedly turned forward; posterior lobe of lateral margin of 6th and 7th somites subacute or acute, more or less laterally directed. Cornea set very obliquely on eyestalk. Epipodites present on first 5 thoracic limbs. Denticles 4-6, 7-9, 1. . . . . *bigelowi*, p. 156

- D<sup>2</sup>.** Prelateral angle of telson margin, if present, not spined.

- E<sup>1</sup>.** Of submedian carinae on the abdomen only those of the 6th somite are posteriorly spined.

- F<sup>1</sup>.** Median carina of carapace before level of cervical groove more or less distinctly bifurcate at its anterior and posterior ends; intermediate carinae fall well short of anterior margin.

Cornea set more or less transversely on eyestalk. Lateral spine of 5th thoracic somite stout, curved forward; posterior lobe of lateral margin of 6th and 7th somites acute, sharp pointed, or subacute, directed laterally. Epipodites present on first 4 thoracic limbs. Denticles 2-4, 5-7, 1. . . . . *aculeata*, p. 158

- F<sup>2</sup>.** Median carina of carapace before level of cervical groove not bifurcate anteriorly; if bifurcate posteriorly, only very inconspicuously or incompletely so.

Cornea set definitely obliquely upon eyestalk. Epipodites present on first 5 thoracic limbs.

- G<sup>1</sup>.** Lateral spine of 5th thoracic somite directed more laterally than forward, only slightly inclined forward; posterior lobe of lateral margin of 6th and 7th somites subacute or acute (may be blunt in small specimens), more or less laterally directed, slight if any posterior inclination in 7th somite.

Intermediate carinae of carapace run to or very close to anterior margin. Denticles 3-5, 7-10, up to 14 in some small specimens, 1. Telson more or less rugose or with some small tuberculation either side of median carina; in young specimens the telson is only pitted, as in other species . . . . *hancocki*, p. 160

- G<sup>2</sup>.** Lateral spine of 5th thoracic somite distinctly curved forward; posterior lobe of lateral margins of 6th and 7th somites drawn out to a sharp point directed posteriorly.

Intermediate carinae of carapace fall well short of anterior margin. Denticles 3-5, 7-10, 1. Telson pitted and eroded. . . . . *tiburonensis*, p. 165

- E<sup>2</sup>.** Submedian carinae of 5th and 6th or 4th, 5th, and 6th abdominal somites posteriorly spined.

Epipodites present on first 5 thoracic limbs.

- F<sup>1</sup>.** Portion of median carina of carapace before level of cervical groove bifurcate anteriorly and posteriorly.

Lateral process of 5th thoracic somite a well-developed spine.

- G<sup>1</sup>.** Only 5th and 6th submedian abdominal carinae posteriorly spined.

Lateral spine of 5th thoracic somite curved forward. Posterolateral angle of posterior lobe of 6th and 7th somites directed obliquely backward, usually sharply spinous, seldom only subacute. Intermediate carinae of carapace fall short of anterior margin. Cornea set more or less transversely on eyestalk. Denticles 5-7, 15-19, 1. . . . . *biformis*, p. 165

- G<sup>2</sup>.** Fourth,<sup>34</sup> 5th, and 6th submedian abdominal carinae posteriorly spined.

Lateral spine of 5th thoracic somite directed more or less laterally, not markedly turned or inclined, forward; posterolateral angle of posterior lobe of lateral margins of 6th and 7th somites rounded off or bluntly pointed, subacute in old, well-developed individuals. Intermediate carinae of carapace running to or about to anterior margin. Cornea set very obliquely on eyestalk. Denticles 5-8, 10-13, 1(-2?). . . . . *panamensis*, p. 166

- F<sup>2</sup>.** Median carina of carapace before cervical groove not bifurcate at either end; intermediate carinae very short, fall far short of anterior margin.

Lateral process or processes of 5th thoracic somite inconspicuous, low and undeveloped, at most "a very short obtuse spine [if it can even be called that] that is flattened antero-posteriorly and is connected by a ridge with the short acute ventral spine of the same side" (Bigelow). Only 5th and 6th submedian abdominal carinae posteriorly spined. Mandibular palp was found present only in the largest specimen and then only on the right side, palp with 3 joints at most only obscurely indicated. Cornea set more or less obliquely on eyestalk. Denticles 2-5, 6-9, 1 (usually 4, 7-8, 1). . . *parva*, p. 168

<sup>34</sup> In specimens under 40 mm. in length the 4th abdominal submedians may not be spined.

### *Squilla polita* Bigelow

*Squilla polita* Bigelow, Johns Hopkins Univ. Circ., Vol. 10, No. 88, p. 93, 1891; Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 513, fig. 8, 1894. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 201, 1913 [listed only]. Kemp and Chopra, Rec. Indian Mus., Vol. 22, p. 298, 1926. Bigelow, Bull. Mus. Comp. Zool., Vol. 72, No. 4, p. 182, 1931.

*Distribution:* From Monterey Bay, California, to off Abreojos Point, Lower California, from depths of 23 to 92 fathoms.

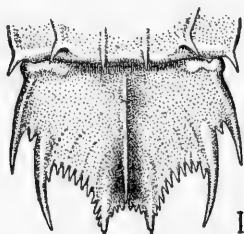


Fig. 2. *Squilla polita*, female, from Santa Rosa Island, California (Albatross Sta. 2902, January 7, 1889). Telson (from Bigelow).

### *Squilla swetti*, new species

*Distribution:* Known only from the female holotype (U.S.N.M. No. 76032) and one male and one female paratype dredged off Petatlan Bay, Mexico, south and west of the White Friars Islands, in 25 fathoms, March 2, 1934 (Hancock Exped. Sta. No. 264-34). This species has been named in honor of Mr. W. Charles Swett, Captain Hancock's former aide and executive officer of the *Velero III*. The holotype is 28 mm. in median length of body exclusive of rostrum, carapace 6.7, rostrum 1.2.

*Description:* A species in many ways reminiscent of *S. fasciata* (de Haan)<sup>35</sup> and *S. miles* Hess,<sup>36</sup> yet differing in several particulars from both. Also related to the first of these is *S. fallax* (Bouvier).<sup>37</sup> Kemp<sup>38</sup>

<sup>35</sup> Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 34, pl. 1, figs. 21-23, 1913, and synonymy.

<sup>36</sup> Kemp, *op. cit.*, p. 36, and synonymy.

<sup>37</sup> Bull. Sci. France et Belgique (7), Vol. 48, Fasc. 3, p. 308, text figs. 39-42, 1915.

<sup>38</sup> Kemp and Chopra, Rec. Ind. Mus., Vol. 22, Pt. 4, No. 22, p. 300, 1921.

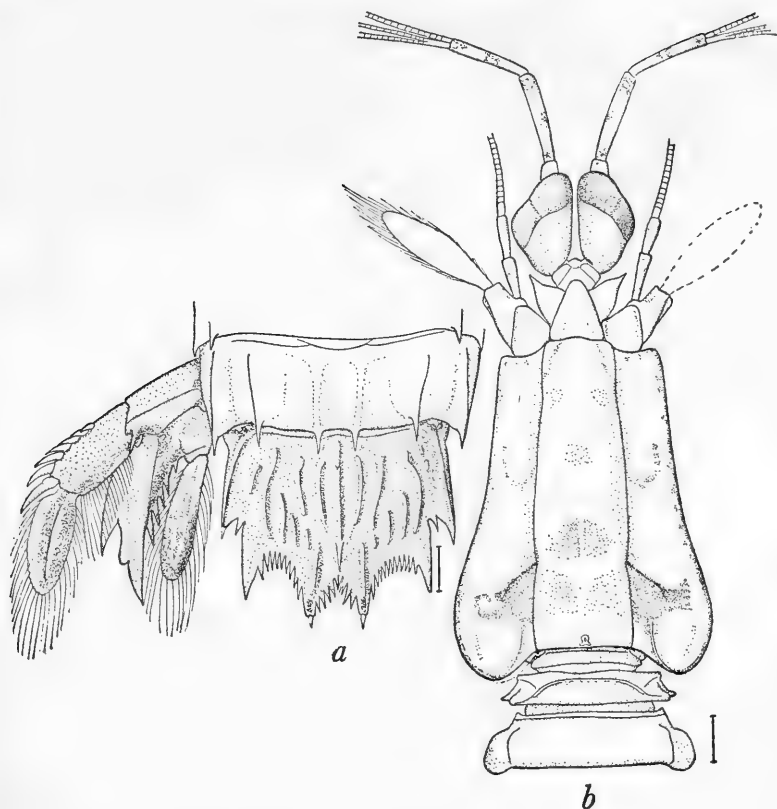


Fig. 3. *Squilla swetti*, female holotype, from off Petatlan Bay, Mexico (Hancock Exped. Sta. 264-34, March 2, 1934). *a*. telson and left uropod; *b*. anterior portion.

says that *fallax*, "apart from the number of teeth [4] on the raptorial dactylus and other characters, differs from *S. fasciata* in the complete suppression of the mandibular palp." This palp is also absent from the species here described.

As in *miles*, the anterolateral angles of the carapace of *S. swetti* are not spined and the rostrum is somewhat longer than broad; in *fasciata* the rostrum is "scarcely broader than long"; in *fallax* the rostrum is quite long and attenuated distally, being about  $1\frac{1}{2}$  times as long as its greatest width.

The dorsal surface of the carapace of *swetti* is smooth and shining. The cervical groove does not cross the median area, although it does interrupt the gastric groove. There are no carinae on the carapace except for the reflexed portions of the marginal carinae, visible in the posterior quarter of the carapace, and within the area bounded by the marginal carina and its reflexed portion there is on either side a faint trace or suggestion of a short bit of what may be taken to represent a posterior remnant of a lateral carina, scarcely more than an angulation in the surface of the carapace that interrupts the reflected light. Just before the mid-point of the posterior margin of the carapace is a small raised ring with 2 posterior oblique, laterally directed rays.

The corneae are obliquely placed on their stalks; their long axis is slightly longer than the median axis of the stalk and the thickness of the cornea taken together. The thickness or perpendicular height of the cornea is about  $\frac{1}{2}$  the median height of the stalk exclusive of the cornea.

The outer inferior angle of the merus of the raptorial leg is rounded; the carpus has a groove and keel above, the latter entire and terminating anteriorly in a rounded-off right angle; the propodus is armed with the usual 3 spines and series of pectinations; the dactylus is armed with 4 teeth, including the terminal one, in this respect like *S. miles* and unlike *S. fasciata*, which has 5 teeth. The outer margin of the dactyl in our species is angled posteriorly and notched just before the angulation. This is also the case in *S. fallax*, but not in *S. fasciata*.

The free thoracic somites are smooth and with carinae on the 6th, 7th, and 8th somites only in line with the intermediates of the abdomen other than the marginals; the 5th somite has a pair of curved carinae almost meeting on the median line anteriorly; lateral processes of this somite consist of 2 low, more or less anteriorly-posteriorly flattened lobes, the upper is somewhat obliquely bent forward and is more prominent on the right than the left side, below on either side of the somite is a ventral spine; lateral margins of the 6th and 7th somites broadly rounded, forming somewhat auriculiform lobes.

No submedian carinae on the abdominal somites except the 6th; intermediate, lateral, and marginal present on all; intermediates and laterals spined on 5th and 6th, marginals spined on 4th and 5th only.

The median carina of the telson is well marked and ends in a prominent spine; it is more or less paralleled either side by 6 thinner carinae (not counting marginal) of various lengths and curvatures; the first pair lie a little within an imaginary line continuing the carinae which



dorsally reinforce the submedian teeth of the telson; these last-named carinae end anteriorly at about the level of the posterior ends of this first pair of carinae on the surface of the telson; the next, 2nd to 4th, carinae either side are more or less equidistant one from the other and lie in the area posteriorly bounded either side by the submedian and intermediate teeth of the telson, the 2nd carina to the left of the median carina is broadly interrupted, that on the right side also but by a shorter, less conspicuous interval nearer its posterior end; the 5th carina either side is more or less in line with the inner margin of the lateral projection or tooth. There is no trace of a prelateral lobe or angle and no ventral carina. The submedian teeth have movable tips, and beneath the terminal spine of the median carina there is a well-marked tubercle; a small one is to be found near the proximal end of this carina forming a small notch, as it were, in lateral view. The denticles number 4-5, 9-11, 1. The bifurcate process of the uropods bears 5 spines on its inner margin; the inner of the 2 projections is about twice the length of the outer; it carries a large lobular tooth on its outer margin.

The greater number of longitudinal carinae, among other characters, will distinguish the new species from *miles*, aside from the presence of the oblique row of tubercles either side of the telson in *miles*; such tubercles are also absent in *S. fasciata*. *S. fasciata* has the telson differently proportioned and has a greater number of longitudinal carinae, differently arranged, and also well-marked prelateral denticles. In *S. fallax* the carinae, except the median carina, the one either side of it, and the marginal ones, have been replaced by more or less regular-irregular rows of tubercles. There are 5 to 7 such rows, according to one's idea of what constitutes a row or line of tubercles; no prelateral lobe or denticle is indicated in Bouvier's figure of the telson.

*Squilla armata* H. Milne-Edwards

*Squilla armata* H. Milne-Edwards, Hist. Nat. Crust., Vol. 2, p. 251, 1837. Bigelow, Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 515, figs. 9, 10, 1894. Rathbun, Revista Chilena Hist. Nat., Vol. 11, p. 50, 1907. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 41, 1913, and synonymy. Stebbing, Trans. Roy. Soc. Edinburgh, Vol. 50, p. 300, 1914. Balss, Stomatopoden in Michaelson, Beitr. Meeresfauna Westafrikas, Crust. III, p. 51, 1916. Chopra, Rec. Indian Mus., Vol. 22, p. 298, 1921. Parisi, Atti Soc. Ital. Sci. Nat., Vol. 61, p. 93, 1922.

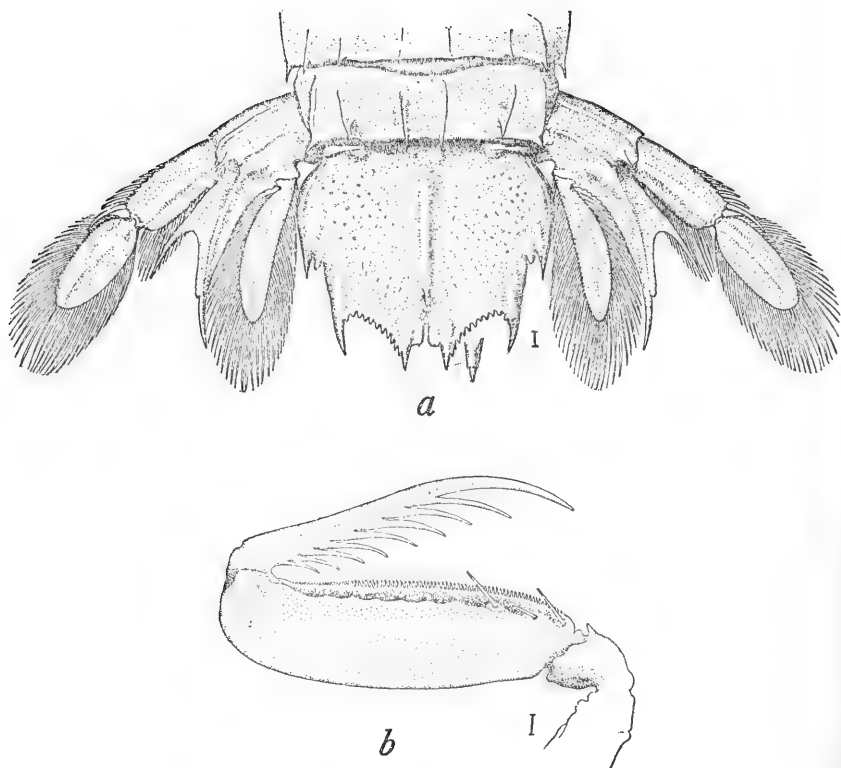


Fig. 4. *Squilla armata*, female, from off southern Chile (*Albatross* Sta. 2783, February 6, 1888). a. telson and uropods; b. rapatorial claw (both from Bigelow).

*Distribution:* Atlantic coast of Patagonia at Gulf of St. George; Cape Horn (Milne-Edwards); coast of Chile, as far north as Valparaiso (Milne-Edwards, Nicolet, Bigelow, Rathbun); New Zealand (Kirk, Chilton); New South Wales (Whitelegge); [German] S.W. Africa (Balss); and off Cape Point Lighthouse, South Africa (Stebbing); from depths of 45 to 122 fathoms.

### *Squilla gracilipes* Miers

*Squilla gracilipes* Miers, Proc. Zool. Soc., 1881, p. 75, pl. 7, fig. 8, 1881. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 200, 1913, and synonymy [listed only]. Parisi, Atti Soc. Ital. Sci. Nat., Vol. 61, p. 93, 1922.

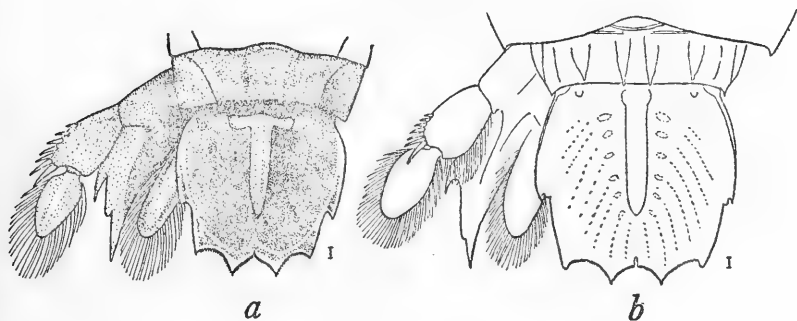


Fig. 5. *Squilla gracilipes*. *a*. telson and left uropod of type, young male from southern Chile ("west coast of Patagonia") (after Miers); *b*. telson and left uropod of male from Valparaiso ("forma larga" after Parisi).

*Distribution:* West coast of Patagonia (Miers); Valparaiso (Parisi).

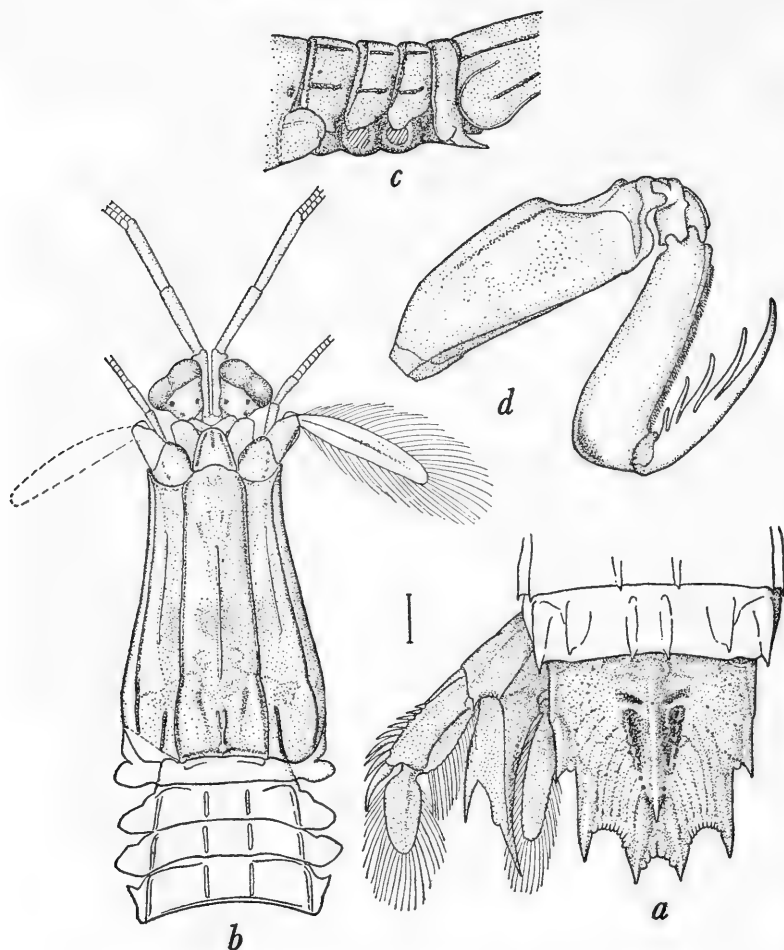
*Squilla hildebrandi*, new species

Fig. 6. *Squilla hildebrandi*, male holotype, from Fort Sherman, Canal Zone (collected by Dr. S. F. Hildebrand, March 3, 1937).  
a. telson and left uropod; b. anterior portion; c. lateral view of free thoracic somites; d. raptorial claw.

*Distribution:* Known only from the unique holotype (U.S.N.M. No. 76068), a male 47 mm. in median length of body exclusive of rostrum, carapace 12, rostrum  $1\frac{1}{2}$  mm. long, from Fort Sherman, Canal

Zone, collected March 3, 1937, by Dr. S. F. Hildebrand, for whom I take pleasure in naming the species.

*Description:* A species with strong Indo-Pacific affinities, inasmuch as it is in many particulars very close to *S. hieroglyphica* Kemp<sup>39</sup> and, like that species, near *S. laevis*<sup>40</sup> Hess. As in both these species, the mandibular palp is entirely missing.

Of the several Pacific-American species here dealt with, it has, next to *S. panamensis*, the most roughly surfaced carapace. This, although to all appearances smooth and shining, is finely pitted or punctate, eroded much as in *S. panamensis*, but not as coarsely so, yet more so than the other west coast species of *Squilla*.

The anterior width of the carapace is nearly  $\frac{1}{2}$  its median length exclusive of the rostrum, much as it is in *hieroglyphica*,<sup>41</sup> where the anterior width equals  $\frac{1}{2}$  the median length; in *laevis* the carapace is stouter, the anterior width being half the length of the carapace including the rostrum. The lateral margins of the carapace are not angulated before the rounded posterolateral angles. The median carina is distinct before the dorsal pit but, as in *hieroglyphica*, not bifurcate, while in *laevis* it is bifurcate; the intermediate carinae are distinct but short, anterolateral spine present, of good size.

The rostrum is wider than its median length and in shape more or less intermediate between *laevis* and *hieroglyphica*; it is carinated as in the latter, but the median carina runs closer to the tip, where a small gap intervenes between the anterior ends of the marginal carinae and also the end of the median carina.

As in *hieroglyphica* and also *S. aculeata*, the cornea is more or less transversely placed on its triangular stalk; in our species the eyestalks are of a rich golden brown color; each stalk, as in *hieroglyphica*, carries 3 prominent spots arranged in the form of a triangle.

As in *hieroglyphica* also, there is no spine at the distal end of the inferior margin of the propodus as in *laevis*; and, like the former species, ours has the raptorial dactylus armed with 5 teeth, including the terminal; in *laevis* there are 4.

The lateral processes of the 5th thoracic somite are in size, shape, and direction more or less intermediate between *hieroglyphica* and *laevis*;

<sup>39</sup> Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 51, pl. 3, figs. 38-41, 1913.

<sup>40</sup> Kemp, *op. cit.*, p. 49, pl. 3, figs. 35-37, and synonymy.

<sup>41</sup> Not including the rostrum, as in Kemp's text, for in his figure the anterior width equals about  $\frac{1}{2}$  the median length exclusive of the rostrum.

the anterior lobes of the 6th and 7th somites are slightly or scarcely marked, the posterior lobes are again intermediate in size and direction, more or less intermediate between those of the 2 nearly related species.

The submedian carinae of the 5th and 6th abdominal somites are posteriorly spined, as are the intermediates of the 4th, 5th, and 6th, the 3rd to 6th laterals inclusive, and all the marginals.

Denticles of the telson are 3, 10, 1; there is no prelateral denticle, the prelateral carina runs little more than halfway to the tip of the lateral tooth; at about this halfway point the carina that is continued to the extremity of the lateral tooth begins; the marginal teeth of the telson are of good size and sharp, with laterals a little exserted and about as long as submedians and both a little shorter than the intermediate teeth, and thus, except for the prelateral angle or spine of the latter, more like *laevis* than *hieroglypha*. At about  $\frac{3}{4}$  the length of the median carina of the telson from the extremity of the terminal tooth or spine, a small, shallow punctation more or less inconspicuously interrupts the crest of the carina.

*Color:* In coloration or arrangement of the chromatophores our species is not unlike *hieroglypha*. The chromatophores, although generally sparsely scattered, are on the carapace aggregated in a line along the median carina, the gastric grooves, the proximal half of the intermediate carinae, the whole of the lateral carinae, and the reflexed portions of the marginal ones, as well as along the posterior margins of all the free somites behind the 5th thoracic, except the 6th abdominal. On the telson the chromatophore arrangement bears a striking resemblance to that found in *hieroglypha*, which Kemp says is unlike any other species; however, *hieroglypha*, as figured, has neither the 2 pairs of isolated spots either side of the median carina of the telson near its posterior extremity nor the little band of 6 more or less coalescent chromatophores around the hinder end of the median carina beneath the terminal spine, the latter appears also to have been somewhat dark colored toward its tip in life in our species.

***Squilla dubia* H. Milne-Edwards**

*Squilla dubia* H. Milne-Edwards, Hist. Nat. Crust., Vol. 2, p. 522, 1937. Bigelow, Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 518, 1894. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 200, 1913, and synonymy [otherwise only listed]. Kemp and Chopra, Rec. Indian Mus., Vol. 22, p. 298, 1921. Lunz, Jour. Elisha Mitchell Sci. Soc., Vol. 51, No. 1, p. 157, fig. 5, 1935.

*Squilla rubrolineata* Dana, Crust. U.S. Explor. Exped., Pt. 1, p. 618, 1852, pl. 41, fig. 2, 1855.

*Squilla alba* Boone, Bull. Vanderbilt Mar. Mus., Vol. 2, p. 35, pl. 5, 1930 (I have examined the type).

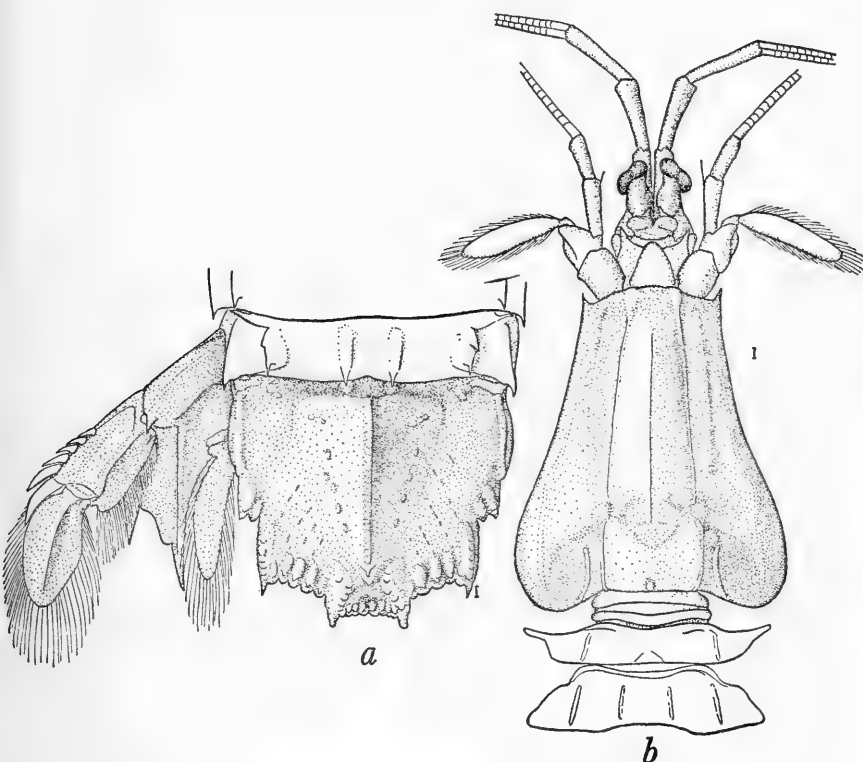


Fig. 7. *Squilla dubia*, female, from salt lake near Guayaquil, Ecuador (collected by Dr. W. H. Jones, U.S.N., December 19, 1884). *a*. telson and left uropod; *b*. anterior portion.

*Distribution:* East coast of America from Charleston, South Carolina, to Rio de Janeiro, Brazil, including Georgia, British Honduras, Cuba, Santo Domingo, Trinidad, and Limon Bay, Panama; west coast from El Triunfo, El Salvador, to Rio Tumbes, Peru, including Punta Arenas, Costa Rica, Guayaquil, Ecuador, from a salt lake back of town, and a male specimen in the National Museum collections just determined which was found on the mud at low tide at the Pacific entrance to the Panama Canal by the Marsh-Darien Expedition, July, 1924.

*Remarks:* The identity of Dana's *Squilla rubrolineata* with the present species hitherto questioned, I believe, may be accepted. The few discrepancies that are to be noted do not seem to be of sufficient moment to warrant the continued doubt. The eyestalks, as drawn in Dana's Atlas, perhaps are not what they should be. They are different from the more usual "Squilla" type of eye and do more or less resemble the eyes of *S. dubia*; also the transverse axis of their corneae is oblique to, and not longer than, the longitudinal axis of the ocular peduncle. The median keel of the telson in smaller specimens of *dubia* is always sharper than in older and more developed specimens; the latter usually have the margins of the telson very much thickened.

### *Squilla bigelowi*, new name

*Squilla panamensis* variety A Bigelow, Johns Hopkins Univ. Circ., 1891; Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 529, 1894.

? *Squilla panamensis* "Variety B" Boone, Bull. Vanderbilt Mar. Mus., Vol. 2, p. 39, pl. 6, 1930.

*Chloridella panamensis* "Variety A" Lunz, Bull. Bingham Oceanog. Coll., Vol. 5, Art. 5, p. 11, fig. 4, 1937.

*Distribution:* Of this species I have seen no material other than that listed by Bigelow. This was taken by the *Albatross* in the Gulf of California. Within the Gulf the species has been collected from Angeles Bay (Lunz) and off Cape Lobos northward to Point San Fermin, Diggs Point, and Consag Rock, 12-76 fathoms. The bottom where recorded, with one exception, was mud of some description, brown, green, and gray; the exceptional case was at one of two stations off Consag Rock (12 fathoms) on gray (green?) sand; the other station off this rock (33 fathoms) had the bottom given as brown mud.



*Type:* A male dredged in 76 fathoms off Cape Lobos, on the east side of the Gulf of California, March 24, 1889 (*Albatross* Sta. 3016), has been selected as the type (U.S.N.M. No. 18462). It measures, in median length exclusive of the rostrum, 96 mm.; the rostral plate  $3\frac{1}{2}$  mm.; the carapace 21; abdomen and telson together 75; telson alone 19.

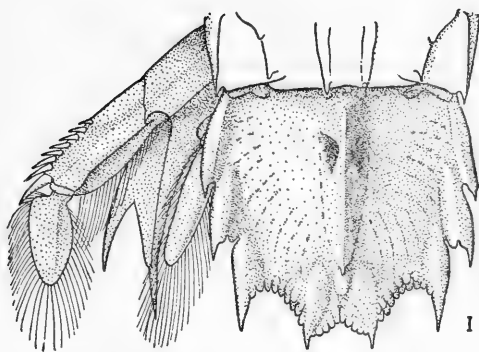


Fig. 8. *Squilla bigelowi*, male holotype, from off Cape Lobos, Gulf of California (*Albatross* Sta. 3016, March 24, 1889). Telson.

*Remarks:* Three specimens from Punta Arenas, Costa Rica, which Miss Boone identified with "*Squilla panamensis* variety B," may belong here, for the illustration which she furnishes has the prelateral angles or lobes of the telson spined. Lunz called attention to this fact. However, the raptorial dactyli of Miss Boone's specimen, as drawn, are armed each with 5 teeth, including the terminal one, while the submedian carinae of the 2nd and 3rd abdominal somites are represented in both the figure and text as being posteriorly spined, as well as those of the 4th, 5th, and 6th somites. In none of the Gulf of California specimens that I have had the opportunity to examine are there less than 6 teeth on the raptorial dactylus, nor are the submedian carinae of the 2nd and 3rd abdominal somites posteriorly spined.

*Squilla aculeata* Bigelow

*Squilla aculeata* Bigelow, Johns Hopkins Univ. Circ., Vol. 12, No. 106, p. 101, 1893; Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 523, figs. 15, 16, 1894. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 200, 1913 [listed only]. Lunz, Bull. Bingham Oceanog. Coll., Vol. 5, Art. 5, p. 8, 1937.

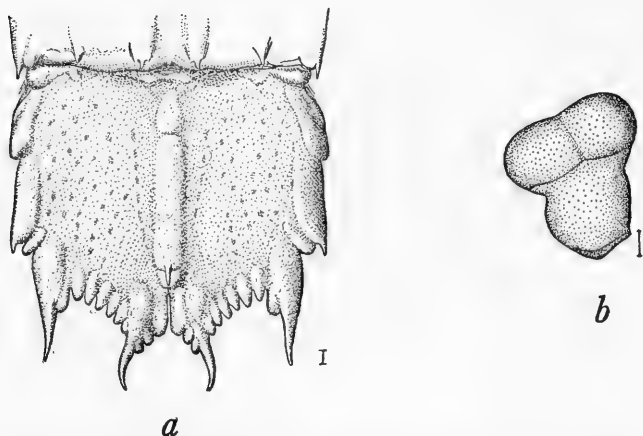


Fig. 9. *Squilla aculeata*, male holotype, from Iquique, Chile (collected by Dr. W. H. Jones, U.S.N., January, 1885). *a*. telson (from Bigelow); *b*. eye.

The magnification of the telson as originally figured by Bigelow is actually  $1\frac{1}{3}$  times natural size and not  $\frac{2}{3}$  natural size as stated under his figure (Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 524, fig. 16, 1894). Also, as the cornea does not appear to me to be quite as transverse as Bigelow depicts it (his fig. 15), the eye has been redrawn.

*Distribution:* Teacapan, Sinaloa, Mexico; Panama; and Iquique, Chile. In addition to the 2 specimens which Bigelow examined, the National Museum now possesses a female 110 mm. in length, taken at Teacapan, Sinaloa, Mexico, by Sr. Carlos Stansch, Direccion Forestal y de Caza y Pesca, Mexico, and 8 others collected by Dr. S. F. Hildebrand, of the U.S. Bureau of Fisheries, in 1937, in tide pools at Panama: 6♀, mostly small (the only large specimen in the lot is 100 mm. long), on the

San Francisco Reef, February 13; and 1 ♂ 1 ♀, respectively, about 68 and 36 mm. long, at Venado Beach, February 26.

*Color:* The color markings of alcoholic specimens still retaining them in general resemble those of *panamensis*, inasmuch as the hind border of the carapace and the following somites of the body are dark margined, except the 1st free thoracic and the 6th abdominal. The telson, however, lacks the pair of small, outwardly turned dark-colored crescents placed one either side of the median carina near its base; also the greater part of the penultimate joint of the outer branch of the uropod is dark colored, while in *panamensis* there is some indication of color only toward the hinder margin of this joint and along its median ridge; the terminal joint in *aculeata* is practically without color, there being only a very small bit along the proximal and proximal inner margin; in *panamensis* the longitudinal  $\frac{2}{3}$  of its expanse next the inner margin is dark colored; the outer third is whitish or without color; the blade of the endopod is about  $\frac{2}{3}$  dark colored.

There is a narrow band of dark color across the dorsum of the second abdominal somite in *aculeata* between the submedian carinae and extending laterally for about  $\frac{1}{4}$  its transverse length to either side beyond the submedian carinae. I do not particularly notice a comparable band of color in *panamensis*, although it is indicated in some small, rather fresh specimens taken by the Hancock Expeditions off Cabita Bay, Colombia. The marginal lobes of the 6th and 7th thoracic somites are almost wholly dark colored, while they seem to be without color in *panamensis*, except for some isolated chromatophores found scattered everywhere in both species.

The carinae of the carapace, except the median, are indicated with fine lines of color. The last 2 joints of the antennular peduncles of *aculeata* are with little color except toward their distal margins; the reverse is true in *panamensis*, in which the greater part of these joints is dark colored and the distal margins light or without color; the antennular flagella in both species show little or no color.

*Remarks:* The marginal teeth of the telson of the figured type have perhaps attained their extreme development; the transverse fissure across the median carina of the telson, near its base and so plainly marked in the figured type, is already indicated in specimens of only 25 mm. in length, and becomes more evident with increase in size; in the corresponding place on the median carina of even good-sized *panamensis* there is only a very slight indentation.

***Squilla hancocki*, new species**

*Distribution:* Known from 25 fathoms off Petatlan Bay, Mexico, from Tangola-Tangola Bay, Mexico, 15-20 fathoms, and from Cape San Francisco, Ecuador, 20 fathoms, muck bottom.

*Type:* The largest of 4 females from off Petatlan Bay (Hancock Exped. Sta. 264-34) has been selected as the type (U.S.N.M. No. 76074). It measures in median length, exclusive of the rostrum, 60 mm., the carapace 13.2, the rostrum 2. This species is named for Captain Allan Hancock, a generous patron of science and a true and good friend of those who have had the great pleasure of going exploring with him.

*Description:* A species in general appearance and markings very like *S. tiburonensis* (= var. *B.* of *S. panamensis* Bigelow). Surface of carapace and abdomen smooth and shining. The anterior width of the carapace is a little more than half its median length exclusive of the rostrum; the median carina before the cervical groove is not bifurcate at either end; the intermediates continue anteriorly to the anterior margin. The rostral plate is more or less subquadrate, slightly tapering, and broadly rounded distally; in *tiburonensis* the rostral plate, though distally rounded off, is elongated triangular with the lateral margins a little convex. In the latter species the rostral plate is margined with color, in *hancocki* it is all colored except for a relatively small semicircular area at the middle of the basal or proximal margin. The corneae are set obliquely on their stalks. The raptorial dactylus, as in the other *panamensis* relatives, is armed with 6 teeth.

The lateral spine of the 5th thoracic somite extends more or less straight out to the side, much as in typical *S. panamensis*, with but slight forward inclination; in *S. tiburonensis* the corresponding spine is distally noticeably turned forward. The lateral margins of the posterior lobes of the 6th and 7th thoracic somites more or less subacute, in any case with tips or lateral extensions with only slight if any posterior inclination: in *tiburonensis* these posterior lobes are sharply and acutely pointed, and these spinous processes are definitely posteriorly directed.

Of the submedian carinae of the abdomen only those on the 6th somite are posteriorly spined; the (3rd?), 4th, 5th, and 6th intermediates are spined, 3-6 laterals inclusive, and all the marginal carinae.

The denticles of the telson number 3-5, 7-10, 1. In this respect, the telson resembles that of *tiburonensis*, and in other respects also it resembles that species, as well as other related *panamensis* forms; yet it differs

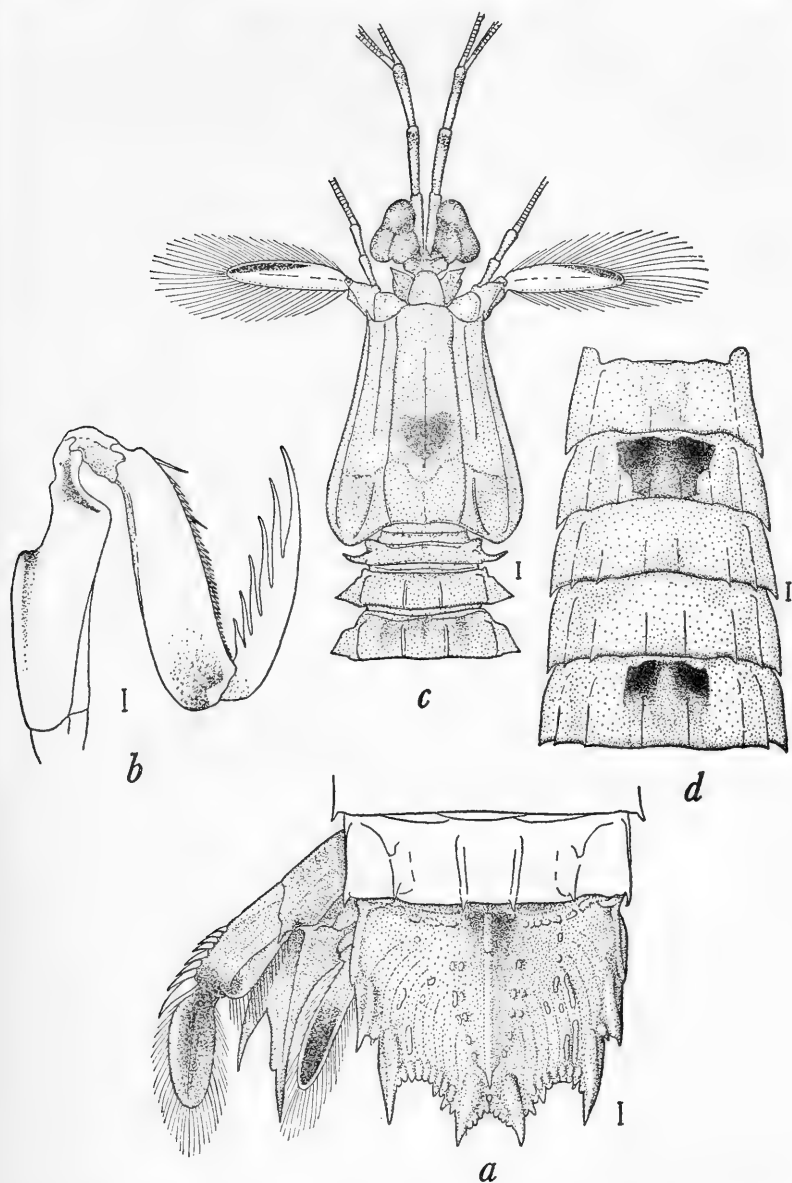


Fig. 10. *Squilla hancocki*, female holotype, from off Petatlan Bay, Mexico (Hancock Exped. Sta. 264-34, March 2, 1934).  
*a.* telson and left uropod; *b.* raptorial dactylus; *c.* dorsal view of anterior portion; *d.* dorsal view of first 5 abdominal somites to show color markings.

strikingly from all these in having a more or less tuberculous, rugose dorsal surface instead of a pitted and punctate one, as in the other species. Either side of the prominent median carina are 6 or more longitudinal, low, rounded rugae, anteriorly more or less tuberculous; the tubercles are somewhat longitudinally elongated, 2 rows more or less paralleling the anterior end of the median carina, the other rows of tubercles anteriorly curve more or less toward the median line. The rugae may be seen in even very small specimens, but the tuberculations do not appear in specimens of less than 44 mm. in median length exclusive of the rostrum; even at this size occasionally one or two or very few tuberculations may be observed; at 47 mm. they increase in number and are plainly to be seen. In the specimens of *S. panamensis* from off Petatlan Bay there are one or two low, blunt tuberculations on the surface of the telson, but I have not otherwise noticed any in the Bigelow material of *S. panamensis*. The inner spine of the bifurcate process of the uropod is twice as long as the outer, the lobular tooth on its outer margin is well marked; its inner margin is serrate, not spined; the basal segment of the exopod carries 8 movable spines on outer margin.

*Color:* In color pattern alcoholic specimens of *S. hancocki* and *S. tiburonensis* are almost identical. The median carina is the mid-line of a narrow, lanceolate area on the middorsum of the telson; this area is much darker marginally, and especially proximally where it forms 2 more or less rectangular areas, one either side of the base of the median carina. A pair of medially placed dark-colored or blackish roughly rectangular areas are located on the dorsum of the 2nd, as well as the 5th, abdominal somites. The somites from the 6th thoracic to the 5th abdominal inclusive have dark-edged posterior margins. The distal end of the penultimate segment of the exopod of the uropods is dark colored, as is also practically the whole of the terminal segment or blade, except for a brief narrow portion of the outer distal margin; not quite as much as the distal half of the terminal blade of the endopod is also dark colored or blackish all over. In *tiburonensis* the blade of the endopod is also distally blackish, but the distal half of the blade is not wholly black, as it is traversed by a longitudinal white or colorless strip. This occupies at least a fourth of the width of the blade just inside the median line, and sometimes is even wider than this.

*Remarks:* In its rugose or ridged telson *S. hancocki* would appear to approach *S. rugosa* Bigelow,<sup>42</sup> but except for this passing similarity the 2 species are very distinct.

<sup>42</sup> *Squilla rugosa* Bigelow, Johns Hopkins Univ. Circ., Vol. 12, No. 106, p. 102, 1893; Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 541, figs. 23, 24, 1894.

In *S. rugosa* a prelateral lobe or angle is not even indicated; in *hancocki*, although blunt, it is well marked. On either side of the median crest of the telson of the former there is a low, but well-defined, convex, bowed-out carina paralleled by a row of longitudinally elongated tubercles; in *S. hancocki*, instead of a carina and one parallel row of tubercles, there are 2 rows of tubercles paralleling each other either side of the median carina. The 5th submedian carinae of the abdomen are not spined posteriorly in *S. hancocki*; in *S. rugosa* they are well spined; otherwise, the carinae of the abdomen seem to be spined alike. The type of *S. rugosa*, between the submedian and intermediate carinae of the 5th and 6th abdominal somites, has the posterior margin of these somites armed with a series of spinules; on the 6th somite, 3 on either side, in the greater interspace between the more medially placed 2 of these spinules is a low, tiny, inconspicuous "button" or bead indicative perhaps of a potential 4th spinule; on the 5th somite there are 4 spinules on the left side and 3 on the right; these spinules are placed nearer their respective intermediate carinae than the submedians; to the outside of each of these groups of spinules on the posterior margin of the 5th somite there is a small, low, spiniform denticle, an incipient spinule. There are no such marginal spinules in *S. hancocki*.

The intermediate carinae of the carapace which run to or just about to the anterior margin in *S. hancocki* fall well short of it in *S. rugosa*.

The lateral spine or process of the 5th thoracic somite appears to have a slightly backward trend in *S. rugosa*, inasmuch as the anterior margin is longer than the posterior beyond the angulations that give this process its somewhat lance-shaped form, while the spines into which the lateral margins of the 6th and 7th somites are drawn out point almost directly backward; in *S. hancocki* the lateral spine of the 5th somite is directed laterally and only slightly inclined or curved forward; the posterolateral angles of the 6th and 7th thoracic somites, although forming an acute angle, are less sharply and attenuatedly spinelike; moreover, the apices of the broader and more flattened lateral spines are directed more or less sideways and with no particular posterior inclination.

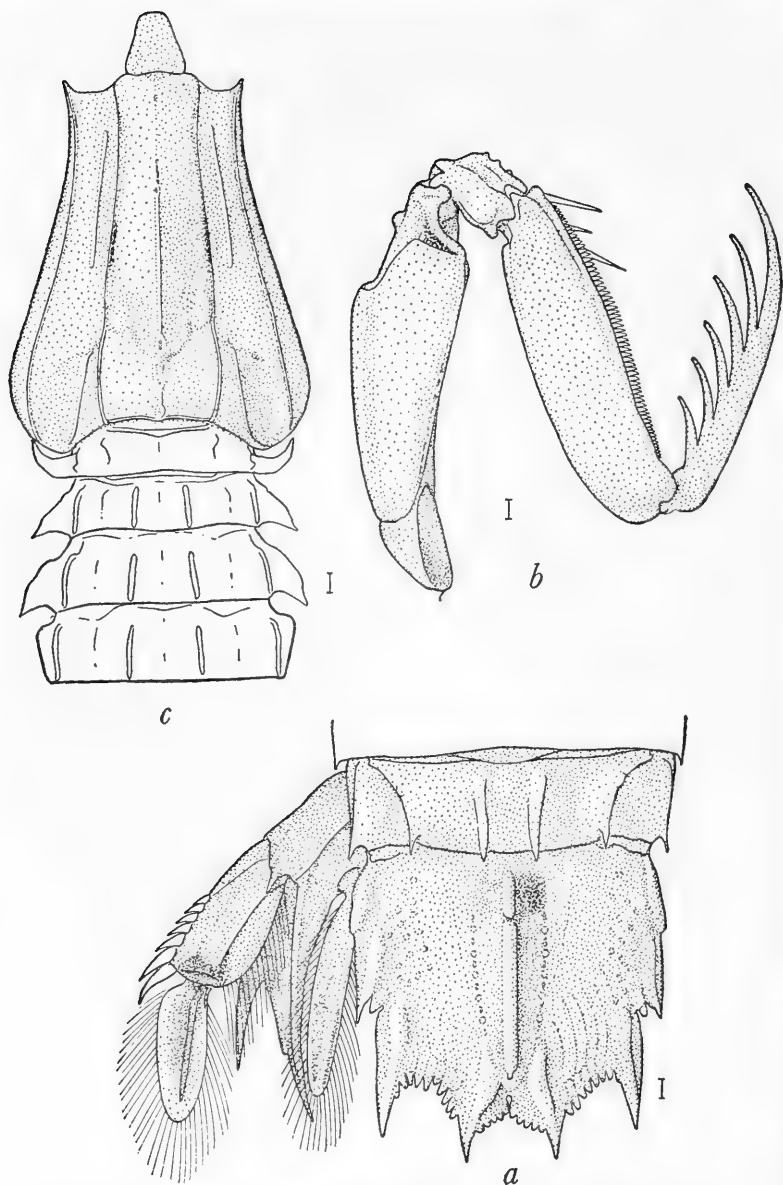


Fig. 11. *Squilla tiburonensis*, female holotype, from S.E. of Tiburon Island, Gulf of California (*Albatross* Sta. 3014, March 23, 1889). *a*. telson and left uropod; *b*. raptorial dactylus; *c*. dorsal view of anterior portion.



***Squilla tiburonensis*, new name**

*Squilla panamensis* variety *B* Bigelow, Johns Hopkins Univ. Circ., Vol. 10, No. 88, p. 94, 1891; Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 529.

*Distribution:* Known only from the Gulf of California, within which its known range extends from Angel de la Guardia Island on the north to Espiritu Santo Island on the south. The type (U.S.N.M. No. 18468) is from S.E. of Tiburon Island (*Albatross* Sta. 3014, March 23, 1889, 29 fathoms).

*Color:* Apart from various morphologic differences, *S. tiburonensis* may be distinguished from *S. panamensis* by its different color markings: basally on the telson, in place of the dark or black crescent either side of the median carina, there is a dark-colored, more or less squarish area. There are also a pair of squarish black areas on the middorsum of the 2nd and 5th abdominal somites. Although most of the articulated somites of the thorax and abdomen have the posterior margin dark edged, the coloration here is not so thick, dense, or conspicuous as it is in *panamensis*. In *tiburonensis* there is very little dark color on the distal margin of the basal (penultimate) segment of the exopod of the uropod, the terminal segment or blade is in its longitudinal outer third more or less white or colorless, in the other two thirds dark colored or black; the distal half of the blade of the endopod is black in its outer half or little more, and white on its inner half except for a narrow longitudinal black line close to the inner margin of the blade. See also color notes on *S. hancocki*, p. 162.

***Squilla biformis* Bigelow**

*Squilla biformis* Bigelow, Johns Hopkins Univ. Circ., Vol. 10, No. 88, p. 94, 1891; Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 532, fig. 20, pl. 21. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 200, 1913 [listed only].

*Distribution:* Known only from specimens secured by the U.S. Fisheries Steamer *Albatross* off La Paz Bay, Gulf of California, 112 to 221 fathoms, March 16, 1889, and in the Bay of Panama, 56 to 259 fathoms, March 9 and 11, 1891.

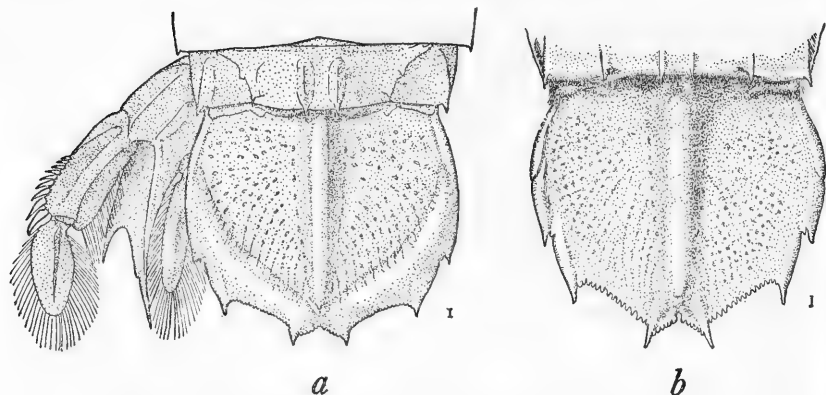


Fig. 12. *Squilla biformis*, from off La Paz Bay, Gulf of California (*Albatross* Sta. 2996, March 16, 1889). *a.* telson of male; *b.* telson of female (from Bigelow).

### *Squilla panamensis* Bigelow

*Squilla Panamensis* Bigelow, Johns Hopkins Univ. Circ., Vol. 10, No. 88, p. 94, 1891.

*Squilla panamensis* Bigelow, Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 526, figs. 17, 18, 1894. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 201, 1913 [part; listed only]. Kemp and Chopra, Rec. Indian Mus., Vol. 22, p. 298, 1921. Parisi, Atti Soc. Ital. Sci. Nat., Vol. 59, p. 92, 1922 [listed only].

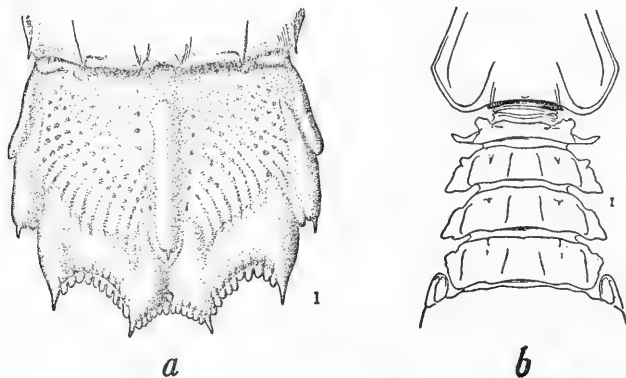


Fig. 13. *Squilla panamensis*, male cotype, from Panama Bay (*Albatross* coll., March, 1888). *a.* telson; *b.* free thoracic somites (both from Bigelow).

*Distribution:* Heretofore known only from the Bay of Panama from a green mud bottom in from 26 to 47 fathoms (*Albatross* Sta. 2799, 2803, 2804), but now also, as a result of the Hancock Expeditions, from much farther north, off Petatlan Bay, Mexico, in 25 fathoms, and farther south, off Cape Corrientes, Colombia, mud bottom, in 10 fathoms.

*Color:* Among the more prominent markings of *S. panamensis* are a pair of outwardly turned, dark-colored or black crescents or arcs of small circles, placed one either side of the proximal end of the median carina of the telson; similar crescents occur in *S. bigelowi* (p. 156), but were not drawn into Bigelow's figure of his *panamensis* telson reproduced here (fig. 13a); the terminal joint or blade of the exopod of the uropod has its inner, longitudinal  $\frac{2}{3}$  dark colored, the outer  $\frac{1}{3}$  white or colorless; the terminal blade of the endopod for the greater part of its inner margin and for more than half its outer margin is dark colored.

The posterior margins of all free somites from the 6th thoracic to the 5th abdominal inclusive are margined with a very conspicuous, though narrow, band of dark color, as are also the anterior and posterior margins of the carapace; 2 lines of color also mark the gastric grooves. The antennal scale has its inner or fore edge also dark colored. There is also a conspicuous spot of dark color on the upper margin near the anterior end of the merus of the raptorial claw.

*Remarks:* The several lettered varieties, *A*, *B*, and *C*, differentiated by Bigelow from among his *S. panamensis* material all seem worthy of specific rating.

Already in 1917 Calman (British Antarctic "Terra Nova" Expedition, 1910, Zoology, Vol. 3, No. 5, p. 139, fig. 1-3) described *S. brasiliensis*, which he believed, and which I feel certain, is identical with Bigelow's "variety *C*." The characters stressed by Calman hold for Bigelow's specimen from off Cabo Frio, Brazil, also the type locality of Calman's material, 4♂ 3♀, 40 fathoms, May 2, 1913 (Sta. 42). Bigelow's specimen was dredged in 59 fathoms, December 30, 1887 (*Albatross* Sta. 2762, blue mud). Further, Hansen (Ark. Zool., Vol. 13, No. 20, p. 7, 1921) records a male of *S. brasiliensis* taken off the coast of Uruguay, 80 meters, December 12, 1901 (blackish gray clay).

Variety *A*, in this paper, has been named for Dr. Bigelow in recognition of his most helpful and valuable contributions to the literature of stomatopods. Variety *B* is named *S. tiburonensis* for its place of origin, Tiburon Island, Gulf of California. Variety *B*, aside from other characters, can at once be distinguished from typical *S. panamensis* by its dif-

ferent color markings; variety *A*, on the other hand, is perhaps closer to *S. panamensis* in this respect than any other species.

The carapace of *S. panamensis*, though appearing fairly smooth and shining when wet, on closer examination is quite rough, pitted and finely eroded, so that when dry it is rather dull and mat surfaced when compared with any of its near relatives, especially the median area of the carapace either side of the median carina. In the several "varieties" the median area of the carapace is smooth and shining even when dry, with but few, if any, punctae.

### *Squilla parva* Bigelow

*Squilla parva* Bigelow, Johns Hopkins Univ. Circ., Vol. 10, No. 88, p. 94, 1891; Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 518, figs. 11, 12, 1894. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 201 [listed only].

*Distribution:* Originally described from the Bay of Panama, 7-16 fathoms, green mud, March 30, 1888, and recorded with a reservation from off Manzanillo, Mexico, 117 fathoms, brown mud, April 26, 1888, this species has since been taken by the Hancock Expeditions at Tangola-Tangola Bay, in 15-20 fathoms; off Petatlan Bay, Mexico, in 25 fathoms; and off Cape San Francisco, Ecuador, in 20 fathoms, muck bottom.

*Measurements:* The largest *parva* I have seen is a male 53 mm. long.

*Color:* The animal preserved in alcohol is symmetrically more or less marbled and mottled, but between the lateral and marginal carinae the abdominal somites are without color, except on their anterior and posterior margins; however, the lateral lobes of the free thoracic somites are colored. The penultimate joint of the other branch of the uropods is distally dark colored, and likewise the inner half, approximately, of the terminal joint. The hinder margin of the carapace and all free somites of the body except the 4th thoracic are heavily limned with dark color (black in the alcoholic specimens), as is also the anterior margin of each somite, though less heavily, except in its middorsal portion, where there is a thin and not particularly noticeable line of chromatophores.

These color notes are based on Hancock Expedition material. All markings, though still faintly discernible, are much faded in the type specimen collected over fifty years ago.

*Remarks:* The rostral plate in juvenile *parvas* is quite triangular. Their coloration sets them apart from *S. hancocki*, with which I have found them associated, and they may also be distinguished by the reduced

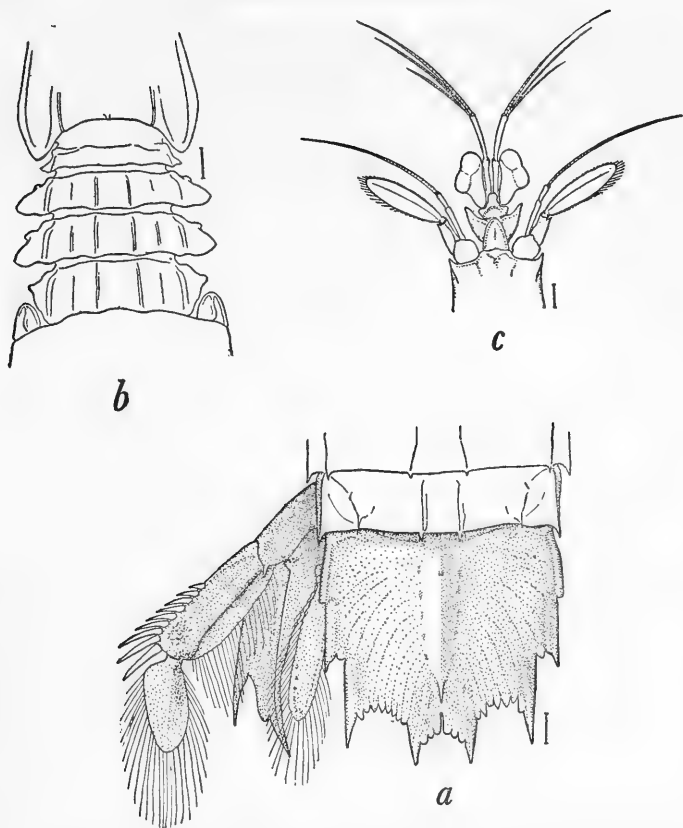


Fig. 14. *Squilla parva*, male holotype, from Bay of Panama (Albatross Sta. 2802, March 30, 1888). *a.* telson and left uropod; *b.* free thoracic somites; *c.* frontal region (*b* and *c* from Bigelow).

number of submedian denticles, which also, in even the smallest specimens, are bluntly rounded off distally, at least those nearest the submedian teeth. I have seen one juvenile which had not yet developed the spine this species carries on each of the anterolateral angles of its carapace. No juvenile specimen seemed to have the median carina of the carapace bifurcate at either end, nor did the intermediate carinae run to the anterior margin; none showed what might be designated as a lateral spine on the 5th thoracic somite; all but the specimen with the unarmed anterolateral angles had the 5th abdominal submedian carinae posteriorly spined.

The raptorial carpus in the adult, or largest specimen noted above, has a noticeably high, thin crest.

Genus **PSEUDOSQUILLA** Dana, 1852

Many species of *Pseudosquilla* and *Lysiosquilla* seem to have much in common. As similar-appearing species ascribed to one or the other of these genera are examined, it becomes evident that the presence of a rather distinct median longitudinal crest or carina on the telson, coupled with the absence of denticles or, rather, spinules<sup>43</sup> between a pair of movable submedian spines or "teeth" on the hind margin of the telson in the adult, is the chief character distinguishing representatives of the former from those of the latter which most resemble them (*i.e.*, *Lysiosquillas* of the second type of Kemp).

The *Pseudosquillas* seem to fall quite naturally into 2 groups on the basis of the number of joints comprising the shorter ramus of the 6th, 7th, and 8th pairs of thoracic legs. This shorter ramus is composed of 2 joints in *P. lessonii*, *cerisii*, *ferussaci*, *pilaensis*, *veleronis*, and I believe also in *P. dofleini*, of which I have seen no specimen, but which its author considered morphologically intermediate between the first 2 species. It will be observed that this grouping also corresponds with the **B** section (p. 96) of the key in Kemp's Monograph.

In the other group, the shorter ramus is composed of but a single joint or segment and here belong *P. ciliata*, *ornata*, *oculata*, *megalophthalma*, and perhaps also *oxyrhyncha*, which also I have not seen. However, the last-named species, on the basis of Komai's remarks,<sup>44</sup> is no doubt a synonym of *P. ornata* and so may not need to be further considered. These species all belong to the **A** section of Kemp's key. There is a very interesting character that the species in this group or section possess in common. That is the structure which Kemp mentions as occurring in *Pseudosquilla ciliata* and its immediate allies, a curious process springing from the dorsal aspect of the antennal protopodite. "This consists of a flat, elongated plate [more or less channeled in some species], directed forwards, and provided inferiorly with a deep vertical keel."

<sup>43</sup> Submedian spinules persist in some species of *Pseudosquilla*, at least until the so-called first littoral stage. In certain species of *Lysiosquilla*, species of the first type (Kemp, Mem. Indian Mus., Vol. 13, No. 4, p. 109, 1913) such as *L. maculata*, without dorsal spines on the telson, but which have the posterior margin of the telson unarmed or cut into a few large, blunt teeth, there are neither submedian spines nor teeth, nor submedian spinules distinguishable as such on the hinder margin.

<sup>44</sup> Mem. Coll. Sci. Kyoto Imper. Univ., Ser. B, Vol. 3, No. 3, Art. 4, p. 324, pl. 14, figs. 2-2b, 1927; Annot. Zool. Jap., Vol. 7, Nos. 3, 4, p. 268, 1938.

These several species also seem to have a more pronouncedly subcylindrical body as compared with the group first listed, in which, indeed, some have very much flattened, depressed bodies.

*Pseudosquilla empusa* has uropods which place it in the **B** section of Kemp's key, and so may have 2 joints to the shorter ramus of the posterior thoracic limbs, but this point needs to be verified. Komai (*op. cit.*) is the first to have seen any specimens of this rare species since originally described by de Haan, but he fails to describe the thoracic limbs other than the raptorial one. His color figure regrettably does not clearly show the structure of the shorter ramus of the 6th to 8th pair.

Although the shorter ramus of the 6th, 7th, and 8th thoracic limbs of *Pseudosquilla* may be composed of one or two segments, in *Lysiosquilla* the number of segments is always 2, as it is also in *Coronida* and *Gonodactylus*; in *Hemisquilla* there is but one; in *Squilla* "the shorter ramus of the last three thoracic appendages is unjointed, or with an imperfect suture separating short basal and long linear distal parts" (Kemp).

In all the species examined the mandibular palp was composed of 3 segments.

The *Lysiosquilla plumata* and *maiaguesensis* of Bigelow<sup>45</sup> are at best immature forms, very small, which unfortunately at some time or other must have dried out completely. They are now preserved in alcohol. The telson of each has an evident median carina and has no submedian spinules; the uropods are of types admissible to the genus *Pseudosquilla*, that of *maiaguesensis* very clearly so. However, I find no trace of a mandibular palp in either species; the shorter ramus of the posterior thoracic limbs is somewhat broadened, narrow bladelike rather than merely linear and seems, moreover, to consist of but the one joint.

As a result of the foregoing remarks and of the species here assigned to the genus, the very excellent generic definition given by Kemp for *Pseudosquilla* needs to be emended: in the first place, the number of teeth on the raptorial dactylus can no longer be limited to 3 or 4, including the terminal one. It should be merely stated (as with *Chloridella*, or *Squilla*) that the raptorial dactylus is toothed. Then, the shorter ramus of the last 3 thoracic limbs is composed of one or two segments. Finally, the basal or ventral process of the uropods may consist of only 2 spines, of which either the inner or outer may be the longer,<sup>46</sup> or of 2 spines with

<sup>45</sup> Bull. U.S. Fish Comm., Vol. 20, Pt. 2, p. 156, figs. 5-9 and 158, figs. 10-13, respectively, 1900 (1901).

<sup>46</sup> Kemp had it that the inner spine was the longer in those *Pseudosquillas* in which the ventral process of the uropod consisted of but 2 well-formed spines. In *P. oculata* the outer spine is much the longer.

an additional spine, or spine and spinules (or denticles) on the inner margin.

*Pseudosquilla*, now *Hemisquilla*, *braziliensis* (Moreira)<sup>47</sup> is an interesting species, inasmuch as it is the Atlantic analogue of the Pacific *H. stylifera*, p. 182.

Key to Species of *Pseudosquilla* Known from the  
Pacific Coast of America

- A<sup>1</sup>. Basal process of uropod terminating in 2 large spines only, of which the outer is the longer; inner margin of process otherwise with at most a little offset or low rounded angulation proximal to base of inner of the 2 spines.

Shorter ramus of last 3 thoracic limbs composed of a single segment. An elongated platelike process arising from dorsal aspect of antennal protopodite. Telson with 4 carinae either side of median crest. Submedian carinae of the 6th abdominal somite dorsally flattened, rounded, anteriorly wide, each tapering sharply to a strong acute posterior spine overhanging the telson; intermediate and lateral spines also present. Eyestalk subtriangular; cornea set transversely on stalk, not overhanging lateral margins, although with median band not bilobed. Rostrum a short, wide, subcordiform plate, anterolateral margins broadly rounded, median spine or point short, subacute. Anterior margin of carapace either side of rostral plate lightly convex, passing directly over into broadly rounded anterolateral angles of carapace. Raptorial dactylus with 3 teeth, including terminal one. Body compressed, subcylindrical; ground color usually quite dark, more or less maculated with numerous medium to small light-colored subcircular spots; maculations on raptorial propodus, carpus and merus large. . . . . *oculata*, p. 173

- A<sup>2</sup>. Basal process of uropod composed of 3 sharp spines, of which one is much the longest and strongest.

This may be either the outermost or the middle one of the three. Shorter ramus of last 3 thoracic limbs consisting of 2 segments. No dorsal process on dorsal aspect of the antennal protopodite.

- B<sup>1</sup>. Outermost spine of basal process of uropod the largest.

Telson with 5 well-marked, prominent and entire, nondenticulated carinae either side of median crest. Submedian carinae of 6th abdominal somite well marked, strongly keeled, posteriorly long spined; intermediate and lateral spines also present. Eyestalk subtriangular;

<sup>47</sup> Lavoura, Bol. Soc. Nac. Agri. Brasileira (N.S.), Vol. 7, p. 60 [5 of separate], 1903. Arch. Mus. Nac. Rio de Janeiro, Vol. 13, p. 5, pls. 1, 2, 1905 [1906 on cover of separate].



cornea bilobed and set very obliquely on stalk and projecting considerably beyond outer lateral margin of stalk, obliquity the reverse of that usually found, the inner margin of the stalk shorter than the outer. Narrow, transverse, subrectangular rostral plate armed with 3 sharp spines, a long, keeled, anterior median one reaching about as far forward as the corneae and one at each anterolateral angle, directed laterally.<sup>48</sup> Anterior margin of carapace either side of rostral plate straight, sloping toward corresponding anterolateral angle of carapace, anterolateral angles rounded. Raptorial dactylus with 3 teeth, including terminal one. Body subcylindrical, not as much compressed as in preceding species, carapace somewhat more flattened; maculations, when present, large and irregular, on carapace more or less confined to posterolateral portions. . . . *lessonii*, p. 175

**B<sup>2</sup>.** Middle spine of the 3 forming the basal process of uropod the largest.

Telson, other than the lateral marginal carina, has one smooth-crested carina either side of median one, and at least 2 or 3 pairs of feeble denticulated carinae or rows of tubercles in addition. Submedian carinae of 6th abdominal somite not particularly indicated except for a pair of submedian spines on the posterior margin of the somite, intermediate and lateral spines also present. Eyestalk cylindrical, cornea set very obliquely on stalk, with median band but not bilobed, projecting very little beyond outer lateral margin of stalk. Rostral plate triangular to subcordiform, wider than long, apically subacute. Anterior margin of carapace either side of rostral plate slightly concave, anterolateral angles blunt. Raptorial dactylus with 7 to 8 teeth, including the terminal one. Body depressed, flattened; mottled to some degree, perhaps, but not maculated, prominent blackish eyespot at each posterolateral angle of 5th abdominal somite. *veleronis*, p. 176

***Pseudosquilla oculata* (Brullé)**

*Squilla oculata* Brullé, in Webb and Berthelot, Hist. Nat. Iles Canaries, Zool., Vol. 2, Pt. 2, Crust., p. 18, fig. 3 on accompanying plate, 1835-44.

*Pseudosquilla oculata* Rathbun, Proc. Wash. Acad. Sci., Vol. 2, p. 155, 1900. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 102, 1913, and synonymy. Bigelow, Bull. Mus. Comp. Zool., Vol. 72, No. 4, p. 165, fig. 8, 1931, and synonymy. Edmondson, Occas. Paps. Bishop Mus., Vol. 7, No. 13, p. 290, fig. 1*b*, 1921.

<sup>48</sup> These laterally directed anterolateral spines of the rostral plate are only well developed in large specimens. In medium-sized and small ones these angles, though they may be laterally but little produced and subspiniform, are very rarely only indicated, usually acute.

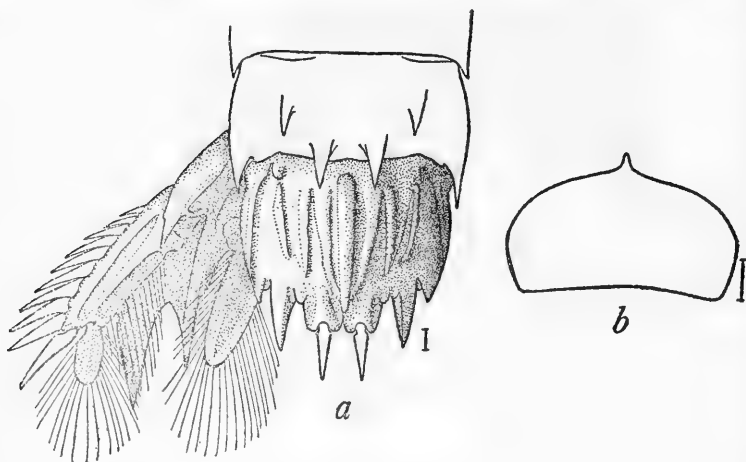


Fig. 15. *Pseudosquilla oculata*, male, from Gardner Bay, Hood Island, Galapagos (Hancock Exped. Sta. 30-33, February 26, 1933). *a*. telson and left uropod; *b*. rostral plate.

**Distribution:** A widely distributed species. Atlantic Ocean: Canary Islands, Madeira, Cape Verde Islands, and Maceio, Alagoas, Brazil. Indian Ocean: Chagos Islands and Mauritius. Pacific Ocean: Bonin Islands, China Sea (Macclesfield Bank), Gilbert Islands, Laysan, Hawaiian Islands, Samoa, Society Islands, Clarion Island (Mexico) (Rathbun, Kemp, Edmondson, Bigelow).

To the foregoing Pacific localities may be added the Tres Marias Islands, Mexico, from which a single female was obtained by Dr. Carlos Stansch, of the Direccion Forestal y de Caza y Pesca, in 1927, and a number of specimens taken by the Hancock Expeditions on the Pacific coast of the Republic of Panama and Colombia and in the Galapagos Islands.

**Size:** Most of the specimens in the collection are quite small, but there is one large female from Osborn Island in Gardner Bay, Hood Island (Sta. 30-32), which appears to be the largest known representative of the species. In median length inclusive of the rostral plate, it is about 86.5 mm. long, the carapace measures 17.1, the rostral plate  $3\frac{1}{2}$ ; if measured over the movable submedian spines, the total length would approach 89 mm. As far as I have been able to ascertain, the next specimen in point of size is that seen by Miers<sup>49</sup> in the British Museum. It is also a female, and measures " $3\frac{1}{4}$  inches in length" (not quite 83 mm.).

<sup>49</sup> Ann. Mag. Nat. Hist. (5), Vol. 5, No. 9, p. 110, 1880.

***Pseudosquilla lessonii* (Guérin)**

*Squilla lessonii* Guérin, Voy. Coquille, Crust., pl. 4, fig. 1, 1830 [in accompanying text on p. 40 given as *S. cerisii*].

*Squilla marmorata* Lockington, Proc. Calif. Acad. Sci., Vol. 7, p. 33 [6], 1877.

*Pseudosquilla lessonii* Bigelow, Proc. U.S. Nat. Mus., Vol. 17, No. 1017, pp. 499, 502, 1894.

*Pseudosquilla lessoni* Porter, Revista Chilena Hist. Nat. Vol. 7, No. 5-6, p. 274, 1903.

*Pseudosquilla lessoni* Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 202, 1913, and synonymy [otherwise listed only]. Parisi, Atti Soc. Ital. Sci. Nat., Vol. 61, p. 104, 1922.

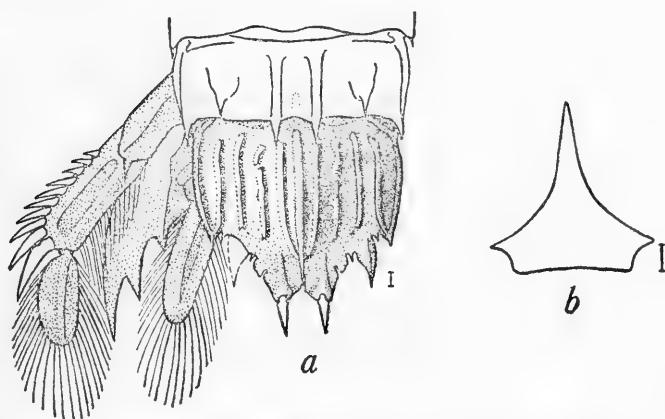


Fig. 16. *Pseudosquilla lessonii*, male, from Black Beach Anchorage, Charles Island, Galapagos (Hancock Exped. Sta. 32-33, January 26, 1933). *a*. telson and left uropod; *b*. rostral plate.

**Distribution:** A west American species ranging from California (Wilmington, San Pedro, and Catalina Island) to Chile; Juan Fernandez (Porter). First recorded from the Galapagos Islands by Bigelow, *Albatross* Surf. Sta. 29, Lat.  $0^{\circ} 46' S.$ , Long.  $89^{\circ} 42' W.$ , off west side Chatham Island, 1 ♂ 2 ♀, from surface tow, depth at this point 271 fathoms (this surface station was made at the same time and position as *Albatross* Dredge Sta. 2817). This species has since been taken by the Hancock Expeditions at Albemarle and Charles Island, Galapagos; La Plata Island, Ecuador; and Independencia Bay, Peru.

*Size:* The largest specimen I have seen is one from Callao, Peru, secured by Dr. R. E. Coker in 1907 while fisheries advisor to the Peruvian government. This specimen, a male, measures, median length exclusive of rostral plate, approximately 125 mm.; carapace 28; rostral plate 6.5. The largest of which I have seen mention is the one in the British Museum, which Miers<sup>50</sup> said was "nearly 5½ inches" long (close to 140 mm.). It is probably one of the several specimens from Chile. The largest Hancock specimen is a male from Independencia Bay, Peru, which measures, median length exclusive of rostral plate, 104 mm., carapace 20, rostral plate 5.

*Color:* Notes taken on a male from Charles Island, in life: burnt sienna × tawny, with naples to buff yellow flecks; appendages a golden brown, nearly orange in effect; fringing hairs of tail-fan aster purple, of antennal scale and pleopods rose purple (colors from Ridgway, Nomenclature of Colors . . . , 1886).

### ***Pseudosquilla veleronis*, new species**

*Distribution:* Known only from material dredged by the Hancock Expeditions: Angeles Bay, Gulf of California; Chacahua Bay, Oaxaca, Mexico; and off Petatlan Bay, south and west of the White Friars Islands, Oaxaca, Mexico, the type locality (Hancock Exped. Sta. 264-34, 25 fathoms, March 2, 1934).

*Type:* A female of perhaps maximum size for the species has been selected as the type (U.S.N.M. No. 76398). In median length exclusive of the rostrum, it measures about 40 mm., carapace 7, rostrum not quite 2. A large male, of which the anterior portion of the body and the raptorial claw is figured, measures about 35 mm., carapace 6.5, rostrum 1.5.

This species has been named for Captain Hancock's personally designed motor cruiser, the *Velero III*, the excellence of which has contributed so much to the success of the expeditions undertaken by Captain Hancock since the year of her launching, 1932.

*Description:* Of the *Pseudosquillas* perhaps an extreme form in the direction of flattened body, trianguliform rostral plate, transversely wide telson, and number of teeth on the raptorial dactylus.

Body depressed, flattened, with no suggestion of the subcylindrical form characterizing most of the *Pseudosquillas*. Greatest width of carapace little more than median length, exclusive of rostral plate, anterior

<sup>50</sup> Ann. Mag. Nat. Hist. (5), Vol. 5, No. 9, p. 113, 1880.

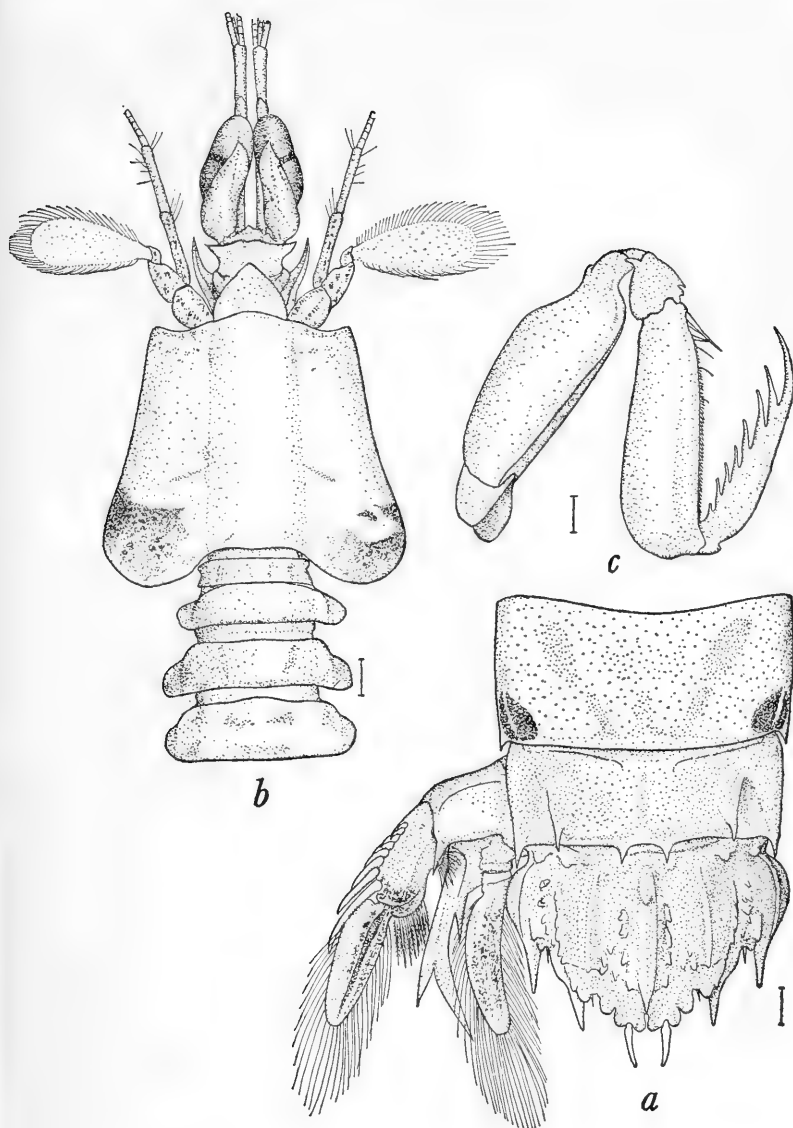


Fig. 17. *Pseudosquilla veleronis*, from Petatlan Bay, Mexico (Hancock Exped. Sta. 264-34, March 2, 1934). *a.* telson, left uropod, and last 2 abdominal somites of female holotype; *b.* anterior portion of male paratype; *c.* right raptorial claw of same.

width perhaps  $\frac{4}{5}$  the length (as drawn, fig. 17a, the posterior portion of the carapace has been spread out so that the greatest width of the posterior portion appears relatively greater than it actually is); antero-lateral angles rounded; rostral plate triangular to subcordiform, wider than long, apically subacute and showing a slight keeling near the tip. The eyestalks appear more or less cylindrical because of great obliquity of cornea, which sits on the stalk at an angle of  $45^\circ$  or more.

Raptorial dactylus armed with from 7-8 teeth, including the terminal one; near the base of the external margin there is a well-marked, rounded tooth or lobe.

Posterolateral angles of 5th thoracic somite inconspicuous, more or less flattened and distally rounded; below there is a flattened, downwardly projecting lobe, or blunt process, either side which is situated below and more or less between the anterolateral and posterolateral angles of the somite, but not visible in dorsal view; lateral margins of 6th and 7th somites rounded.

Posterolateral angles of 5th and 6th abdominal somites produced into spines; posterior margin of 6th somite armed with a pair of submedian spines, but there are no evident submedian carinae; intermediate carinae low and rounded, each ending posteriorly in a sharp spine; above the lateral margin there is a low longitudinal swelling suggestive of a lateral carina—at any rate it converges with the lateral margin to end in the spined posterolateral angle of the somite.

The telson carries a strong, well-marked median carina with rounded crest ending in a short spine; either side and parallel to the median carina is a longitudinal row of low blunt teeth; above and a little distance back from (anterior to) the inner base of each intermediate tooth of the hind margin of the telson a bluntly crested carina runs forward, converging a little toward the proximal end of the median carina; posteriorly, each of these carinae ends in a small, low, rounded tubercle; inside each of these carinae and about in line with their posterior ends is a second little rounded tubercle, anterior to which there may be another smaller and more pointed, though still blunt, one. In a slight outwardly bowed line running from the intermediate spine of the 6th abdominal somite to the intermediate tooth of the hinder margin of the telson is a fairly sharply ridged, but, at irregular intervals, nodulated or blunt-toothed carina, the hinder portion of which may be discontinuous; this posterior portion ends behind in a blunt tooth; between the anterior end of each of these carinae proper and nearer the anterior margin of the telson than the end of the

carina is a distinct, though blunt and rounded, beadlike tubercle. More or less paralleling each of the foregoing carinae along their respective outer sides and turning in toward their posterior ends is a row of individual or separate rounded beadlike tubercles which decrease in size and prominence from the most anterior to the posterior one. In this row there may be from 2 to 5 or more little tubercles. They may be considered as representing a carina, which, however, is not otherwise in evidence; some of these tubercles are paired or twinned laterally. More or less in line with and above and before the lobule, which is itself more or less swollen or tuberculiform, at the inner side of the base of the lateral tooth is a short, low, blunt carina about half as long as the free portion of the lateral tooth of the telson. This carina has a tuberculiform posterior extremity about the size of, or a little larger than, the lobule behind it on the margin of the telson. Beneath, the telson is smooth.

The basal prolongation or process of the uropods is composed of 3 more or less slender, sharp spines, of which the middle one is much the strongest and longest, being 2 or more times as long as the outermost spine, which, in turn, is stouter than, but not as long as, the innermost of the 3. This last-mentioned spine is placed high up on the inner margin of the basal process.

*Color:* There is a light, more or less symmetrical pattern of chromatophores over the carapace and abdomen. Near the posterolateral angles of the carapace in some specimens (usually males) there is a darker patch. In all specimens there is a distinctive and characteristic black, subcircular eyespot with a light-colored longitudinal band through the middle ornamenting the dorsum of each posterolateral angle of the 6th abdominal somite. In only one specimen, a male of average size, is there a second pair of black spots, more or less triangular in this instance, on the abdomen, placed one to each side of the first abdominal somite at its posterior margin and just above its epimeral portion. In this specimen, too, the posterior pair of black eyespots are more nearly elongate rectangular, with rounded corners, than roughly subcircular as in the other specimens. The inner, longitudinal  $\frac{2}{3}$  of the distal joint of the exopod of the uropods is dark colored, as is also the distal, transverse 4th or 5th of the preceding joint; the distal  $\frac{2}{3}$  of the terminal joint or blade of the endopod is also dark colored, while on the telson proper there is a small patch of dark color laterally near the base of each lateral spine, and also a similarly colored area before the base of each of the pairs of movable submedian spines either side of the median carina and fading out anteriorly just past the middle of the length of the telson.

*Remarks:* The species here described as a representative of the genus *Pseudosquilla* certainly is properly accredited to this genus on the basis of the character of the telson alone, irrespective of the number of teeth on the raptorial dactylus. In character, the telson of our species shows some resemblance to *Pseudosquilla pilaensis* de Man<sup>51</sup> from the Indo-Pacific, which is the only *Pseudosquilla* heretofore known with more than 3 teeth on the raptorial dactylus, counting the terminal one.

The body of *P. veleronis* is very much flattened like many of the *Lysiosquillas*, yet, in contradistinction to them, exhibits no trace whatsoever of even one soft papilla on the ventral surface of the antennal protopodite. At least one papilla in this position is probably to be found in the adult of every species of *Lysiosquilla*.

In addition to the 5 species of *Lysiosquilla* already examined by Kemp for these papillae, I have observed their presence in ten other species of *Lysiosquilla*.<sup>52</sup>

*L. armata* Smith  
*L. biminiensis* Bigelow  
*L. digueti* Coutière  
*L. eusebia* (Risso)  
*L. excavatrix* Brooks

*L. glabriscula* (Lamarck)  
*L. latifrons* de Haan  
*L. mccullochae* Schmitt  
*L. polydactyla* von Martens  
*L. scabricauda* (Lamarck)

<sup>51</sup> Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 105, 1913. Schmitt, Lingnan Sci. Jour., Vol. 8, p. 140, pl. 19, figs. 12-14, 1929.

<sup>52</sup> See also under Genus *Lysiosquilla*, page 184.



Genus **HEMISQUILLA** Hansen, 1895<sup>53</sup>

The genus comprises at least 2 species, *H. stylifera* (M.-Edw.), 1837, described from the coast of Chile, and *H. braziliensis* (Moreira), 1905, from the coast of Brazil. The substitution of the name of *bigelowi* Rathbun, 1910, for *stylifera* M.-Edw. because of conflict with *stylifera* Lamarck, 1818 [= *Pseudosquilla ciliata* (Fabr.), 1787] within the genus *Pseudosquilla* needs no longer to be taken into account, since the first-named *stylifera* is now the type of *Hemisquilla*.

Although the Hemisquillas from Australia, California, and the west coast of South America are so very much alike in practically all particulars, as Kemp says, "it is not improbable that distinct races of [*H.*] *stylifera* exist on the coasts of Australia and America, but this cannot be established with any certainty without the examination of large numbers of specimens from the two localities."

I am inclined to believe that the difference in the number of lobes in the interval between the submedian and intermediate teeth is of more significance than may seem justified at present. Despite the fact that the number of lobes in this position was not mentioned by Whitelegge<sup>54</sup> in commenting upon the 3 specimens he had from 28-40 fathoms from Newcastle Bight, New South Wales, it is known that the specimens from the west coast of America do differ from certain Australian ones in the manner figured by Kemp for one of his two specimens of *stylifera* from Disaster Bay, Victoria.

Kemp's Australian specimens have 2 rounded lobes between the submedian and intermediate spines of the telson, while his specimen from Coquimbo, together with Miers'<sup>55</sup> from the same place, and his additional one from Chile without more specific designation, like Milne-Edwards'<sup>56</sup> figured one, have but one lobe between the submedian and intermediate spines. This is also true of the specimen Bigelow had from San Pedro, and one in the National Collections from "southern California."

*H. braziliensis* (Moreira)<sup>57</sup> from the east coast has also but a single

<sup>53</sup> Hansen, *Ergebn. Plankton Exped.*, Vol. 2 [Pt.] G. c., p. 72, 1895, type *H. stylifera* (M.-Edw.). Kemp and Chopra, *Rec. Indian Mus.*, Vol. 22, Pt. 4, No. 22, p. 307, 1921.

<sup>54</sup> *Mem. Australian Mus.*, Vol. 4, No. 2, p. 198, 1900.

<sup>55</sup> *Ann. Mag. Nat. Hist.* (5), Vol. 5, p. 112, 1880.

<sup>56</sup> *Hist. Nat. Crust.*, Vol. 2, p. 530, pl. 27, figs. 9-14, 1837.

<sup>57</sup> Lavoura, *Bol. Soc. Nac. Agri. Brasileira*, Vol. 7, Nos. 1-3, p. 60, 1903 [p. 5 in reprint with 2 text figures]; *Arch. Mus. Nac. Rio de Janeiro*, Vol. 13, p. 5, pls. 1, 2, 1906 [1905].

lobe in the same position, but this lobe is armed with a small spine or well-developed spinule upon its "postero-distal" angle; another such spinule on a small lobular swelling or base is situated in the sinus between the intermediate lobe and the intermediate spine, and still another of approximately the same size and conformation intervenes between the intermediate and lateral spine of the margin of the telson. In the positions corresponding to the last 2 spinules named, the telson of the west American and Australian *stylifera* has a tiny unarmed and dorsally well-nigh inconspicuous swelling or lobule; in these Pacific forms, also, the intermediate lobes are posteriorly unarmed, without spines or spinules.

Kemp's remarks on the segmentation of the mandibular palp of his specimens are also of interest. His Chilean specimen has mandibular palps composed of 3 segments, his Australian specimens, of but 2. No doubt the right and left palp of each specimen was examined. Yet in our one specimen from southern California the palp of the left side is composed of 2 segments and the one on the right of 3. The reverse of this count occurs in the male cotype of *H. braziliensis*, the female has both palps 3-segmented, while the 3rd specimen of the species at hand, a male from Ilha Rosa, Rio de Janeiro, has palps of only 2 segments each. This variation in the number of segments in the mandibular palps of even the one species may be rather the exception among stomatopods, but, nevertheless, in the genus *Hemisquilla* it renders the palp unavailable for specific characterization.

### ***Hemisquilla stylifera* (H. Milne-Edwards)**

*Gonodactylus styliferus* H. Milne-Edwards, Hist. Nat. Crust., Vol. 2, p. 330, pl. 27, figs. 9-14, 1837. Porter, Revista Chilena Hist. Nat., Vol. 7, No. 5-6, p. 274, 1903.

*Pseudosquilla bigelowi* Rathbun, Proc. U.S. Nat. Mus., Vol. 38, No. 1766, p. 608, 1910.

*Pseudosquilla stylifera* Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 106, one text fig., pl. 7, figs. 84-85, 1913, and synonymy.

*Pseudosquilla bigelowi* Hilton, Jour. Ent. Zool., Pomona College, Vol. 7, No. 2, p. 77, text figs., 1915; and Third Rept. Laguna Mar. Lab., Pomona Coll., Art. 20, text and figure as in the Journal for November, 1915.

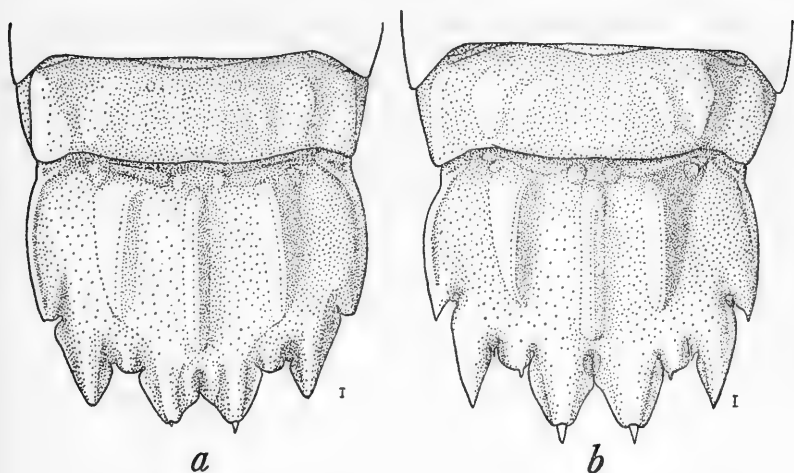


Fig. 18. *a. Hemisquilla styliifera*, male from southern California, telson, and last abdominal somite; *b. H. braziliensis* from Ilha Rosa, Estado Rio de Janeiro, Brazil, telson and last abdominal somite.

**Distribution:** As summarized by Kemp, this species "has been recorded from Chili (Milne-Edwards, Nicolet, Miers), from California (Bigelow, Holmes), from the Hawaiian Islands (Randall),<sup>58</sup> and from Newcastle Bight, New South Wales (Whitelegge). It is strange that the species has not been found on the New Zealand coast." It has also been recorded from Juan Fernandez (Porter).

<sup>58</sup> Balss believes (Bronns Klassen und Ordnungen des Tierreichs, Vol. 5, Abt. 1, Book 6, Pt. 2, Stomatopoda, p. 138, 1938) that this old record of Randall's, still uncorroborated, is based on a mistaken identification of *P. ciliata*, common in the Islands.

Genus **LYSIOSQUILLA** Dana, 1852

The genus has been fully defined by Kemp. With regard to the soft elongated papillae found on the antennal protopodite, Kemp remarks that they are found perhaps in all species of the genus. He says, "These are well developed in *L. maculata* and are three in number, one situated antero-dorsally and curved backwards and inwards towards the rostrum and two on the ventral surface at the base of the endopod, a long one directed forwards and a much shorter one pointing backwards. In *L. acanthocarpus*, *L. multifasciata*, *L. spinosa*, and *L. insignis* only one of these processes is found placed on the ventral surface and pointing outwards or backwards." To this list of species having just one of these processes ventrally placed may be added *L. biminiensis* Bigelow and *L. digueti* Coutière, which have the process long and slender, and *L. latifrons* de Haan, in which the process is short and really papillalike. *L. excavatrix* Brooks seems to have at least one small papillalike process below; the larger of the 2 small specimens which I have had available for examination is in very poor condition, while the smaller one is too young apparently to have developed the papilla. *L. decemspinosa* Rathbun, of which there are several specimens in the National Collections, is perhaps a juvenile or late larval form, all of the specimens are quite small, and I have not been able to discover any papillalike structures in any of them. *L. polydactyla* von Martens has 2 papillalike processes below.

Three species may be placed alongside *L. maculata* in possessing 3 elongated papillae more or less comparably placed: *L. glabriscula* (Lamarck), *L. scabricauda* (Lamarck), and *L. armata* Smith.

Two other species, *L. eusebia* (Risso) and *L. mccullochae*, described below have 4 processes, 2 below, of which the anterior is the longer, and 2 on the inner margin of the protopodite, both inclined obliquely forward and visible from above as well as from below.

In *Lysiosquilla* the inner ramus of the 6th, 7th, and 8th thoracic limbs seems always to be composed of 2 segments; in *Pseudosquilla* it may be composed of one or of two segments (see *Pseudosquilla*, p. 170).

In *Lysiosquilla* the size, number, and arrangement of the marginal spines or teeth and the spinules or denticles between them when these are present<sup>59</sup> vary to such an extent that it is difficult to find a formula that would clearly express the number and relationship of the various elements

<sup>59</sup> In *Lysiosquillas* of the second type of Kemp (Mem. Indian Mus., Vol. 13, No. 4, p. 109, 1913).

constituting the marginal or submarginal armature of the telson. Therefore, in the key to species below, the count of the submedian denticles on only one side of the median notch is given.

Key to the Species of *Lysiosquilla* Known from the  
Pacific Coast of America

A<sup>1</sup>. Telson without a transverse row of posteriorly directed dorsal spines above or anterior to posterior margin.

Shorter ramus of 6th and 7th thoracic limbs linear.

B<sup>1</sup>. Telson armed above near posterior margin with a pair of subconical blunt tubercles or low teeth, one either side of a low, short, flattened, median tongue-like projection; telson itself convex.

Eyes large, stalk somewhat subtriangular, cornea not noticeably bilobed, but median band is well marked. Rostral plate elongate triangular, longer than broad at the base, anterolateral margins lightly convex. Raptorial dactylus armed with about 18-20 teeth, including the terminal one. Submedian denticles 12-13. . . *polydactyla*, p. 187

B<sup>2</sup>. Telson unarmed above, without prominent processes, tubercles, or teeth on upper surface.

C<sup>1</sup>. Dorsum of telson smooth, very convex, inflated to the extent that the true posterior margin of the telson and the spinules arming it, except sometimes their extreme tips, are concealed from dorsal view.

Eyestalks more or less cylindrical, cornea subglobular. Rostral plate transversely quadrangular oblong, about  $\frac{5}{9}$  as long on median line as wide, median point a moderately produced acute triangular spine or tooth, anterolateral angles a little produced, almost rectangular, anterior margin slightly excavate or concave either side of median projection. Raptorial dactylus with 11 teeth, including the terminal one. Submedian denticles 9. . . . .  
. . . . . *decemspinosa*, p. 189

C<sup>2</sup>. Dorsum of telson more or less flattened, only moderately convex in either direction, marginal spines or teeth not concealed, plainly visible in dorsal view.

Eyestalks subtriangular, cornea with transverse axis much greater than longitudinal axis of stalk extended across cornea; cornea bilobed and noticeably overhanging lateral margins of stalk.

Rostral plate cordiform, not longer than broad. Submedian spinules or denticles comparable to those of the preceding species or *L. mccullochae*, below, wanting.

- D<sup>1</sup>. Surface of telson smooth and punctate; median area only slightly raised above general surface; of the marginal spines or teeth only the lateral pair is ever acute, submedians and intermediates often no more than low lobes; no denticles; hind margin entire except for shallow median notch.

Posterior margins of 5th and 6th abdominal somites smooth, unarmed. Rostral plate not longer than greatest width, sometimes shorter. Raptorial dactylus armed with 9-17, usually 10, teeth, including the terminal one; female dactylus exhibits secondary sexual characters. . . . . *maculata*, p. 190

- D<sup>2</sup>. Upper surface of telson roughened, scabrous, tuberculated, or even spiny to some extent; median area somewhat raised posteriorly to form a low, broad, blunt elevation or tooth conforming with backward slope of telson; 6 pairs of marginal spines or teeth well developed, subacute to spiniform; submedian denticles well marked, though broad, and more or less coalesced.

Posterior margins of 5th and 6th abdominal somites spinulated. [Rostral plate, if like *scabricauda* (Lamarck), about  $\frac{4}{5}$  as long as greatest breadth.] Raptorial dactylus armed with 11 teeth, counting the terminal one. . . . . *desaussurei*, p. 193

- A<sup>2</sup>. Telson with a transverse row of dorsal spines in addition to those of posterior margin.

Ultimate segment of shorter ramus of 6th if not 7th thoracic limb more or less broadly ovate. Submedian spines of telson movable.

- B<sup>1</sup>. Five more or less subequal and equidistant dorsal spines in transverse row on telson.

Telson rather evenly convex before transverse row of spines. Rostral plate more or less squarish-rectangular, median projection and anterolateral angles each produced to form a prominent acute spine, the 3 spines more or less subequal. Eyestalks more or less cylindrical, cornea subglobular. Raptorial dactylus with 8 teeth, counting terminal one. Submedian denticles 3. . . . . *diguetti*, p. 194

- B<sup>2</sup>. At least 9 dorsal spines in transverse row on telson.

Raised median area of telson obscurely tricarinate, each carina ending in a simple acute spine; next dorsal carina either side ending

posteriorly in 3 small spines; next 2 carinae in order ending in simple posterior spine. Rostral plate broadly cordiform, more or less subrectangular, median projection broadly triangular, acute; anterolateral angles broadly rounded, median length about  $\frac{3}{4}$  greatest width. Eyestalks flattened cylindrical to subtriangular; cornea bilobed and set more or less transversely on stalk. Raptorial dactylus with 4 teeth, including terminal one. Submedian denticles 8-9. . . . . *mccullochae*, p. 197

### **Lysiosquilla polydactyla** von Martens

*Lysiosquilla polydactyla* von Martens, Sitzb. Ges. naturf. Fr. Berlin, p. 92, 1881. Bigelow, Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 504, 1894 [in key only]. Doflein and Balss, Mitt. Nat. Hist. Mus. Hamburg, Vol. 29, p. 40, 1912. Kemp, Mem. Indian Mus., Vol. 4, No. 1, 1913, p. 203 [listed only].

**Distribution:** Very few specimens of this species have ever come to light and those only with not altogether certain locality data. The unique type was found unlabeled among a lot of material consisting of well-known Peruvian and Chilean species, while the 3 listed by Doflein and Balss were included in a collection made by the late Dr. Fredrico T[eobaldo] Delfin in Chilean waters, and are believed quite certainly to have been secured in Orange Bay, Hoste Island, south of Tierra del Fuego.

**Size:** The length of the type from tip of rostral projection is about 95 mm., carapace 21. The Doflein and Balss specimens are all three males. Measured on the median line, exclusive of rostral plate, they are approximately as follows: 63 mm. long, carapace 11.2, rostrum 4; 69.5 mm. long, carapace 12.2, rostrum 4; 69.5 mm. long, carapace 12.4, rostrum 4.5; this last is the specimen figured here.

**Remarks:** Through the exceeding kindness of Dr. A. Panning, Custodian of the Hamburg Museum, I have been enabled to examine the 3 specimens recorded by Doflein and Balss.

In general appearance and coloration, *L. polydactyla* resembles *L. maculata* and *L. scabricauda*, but nevertheless is somewhat intermediate between these forms with dorsally unarmed telson and those that carry a transverse row of dorsal spines, inasmuch as the submedian spines of the telson are movable. The median raised area of the telson of *L. polydactyla* ends in a broad tonguelike projection, while the single, flattened, obsolescent carina either side ends in a small, blunt, tuberculiform tooth. In large specimens of *L. scabricauda*, at least occasionally behind the median

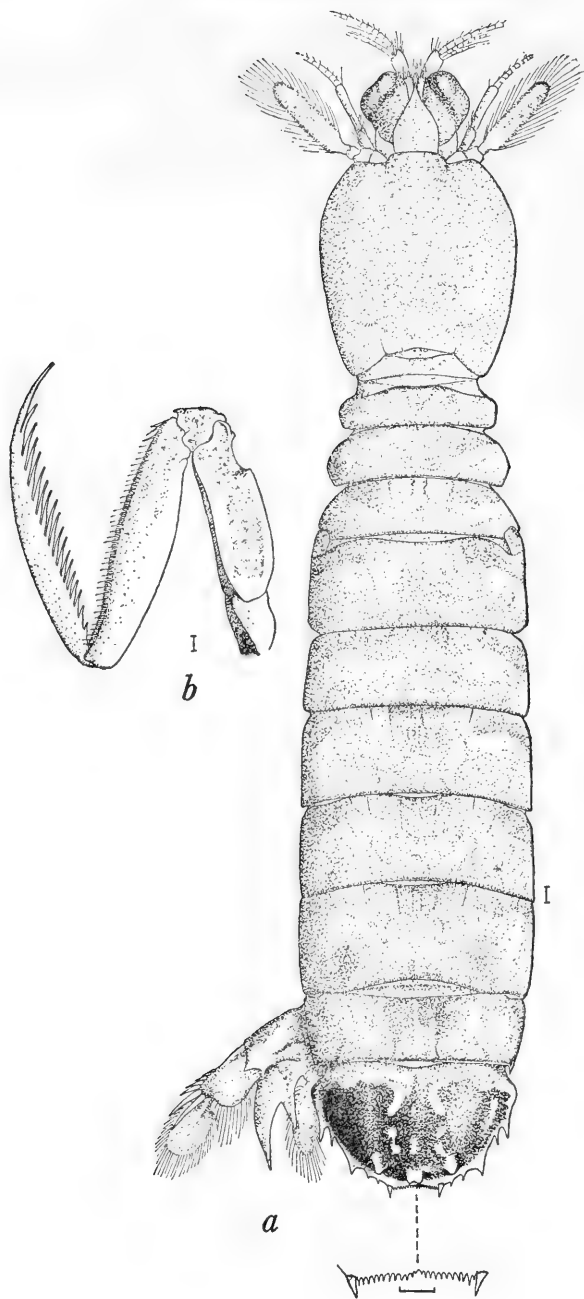


Fig. 19. *Lysiosquilla polydactyla*, male, probable origin: Orange Bay, Hoste Island, south of Tierra del Fuego. *a.* dorsal view; *b.* raptorial dactylus, magnification not noted, indication given with figure is tentative only.



raised area, there may be found a single low tubercle in advance of the median notch; otherwise, the scattered small tuberculi on the dorsal surface of the telson are its only armature that in no way are analogous to or represent the transverse row of spines carried in the *Lysiosquillas* having dorsal spines on the telson. In *L. maculata* behind the scarcely elevated median area there may be a small low swelling, but this in no sense is tuberclelike.

*L. polydactyla* has very short, stout, and somewhat curved, but nevertheless movable, submedian teeth or spines on the posterior margin of the telson; the intermediate and lateral teeth are somewhat smaller. Between the submedian and lateral teeth either side are 2 tiny and widely spaced denticles or rather spinules which arise from the under side of the telson; a single one occurs between the lateral and submedian, while the number of tiny spiniform denticles on either moiety of the posterior margin between the movable submedian teeth is 12-13. Beneath, the telson is smooth and unarmed.

The ventral bifurcate process of the uropods of *L. polydactyla* is composed of 2 stout flattened spines, of which the outer is much stronger and broader and fully  $\frac{2}{5}$  longer than the inner one.

### *Lysiosquilla decemspinosa* Rathbun

*Lysiosquilla decemspinosa* Rathbun, Proc. U.S. Nat. Mus., Vol. 38, No. 1766, p. 566, pl. 53, fig. 3, 1910. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 203, 1913 [listed only].

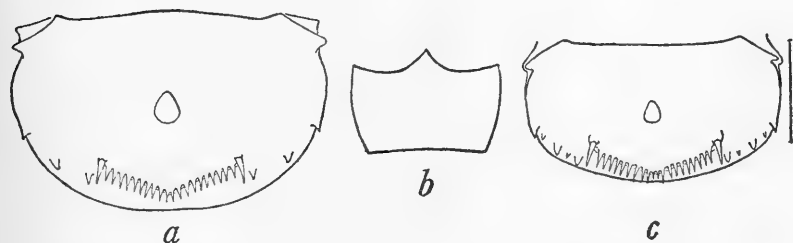


Fig. 20. *Lysiosquilla decemspinosa*. a. ventral view of type female from Capon, Peru; b. rostral plate of same; c. ventral view of telson, male, from Playa Blancas, Costa Rica (Hancock Exped. Sta. 460-35, February 8, 1935) (a, b, and c magnified alike).

*Distribution:* Originally described from Capon, Peru, where the 4 specimens of the type lot were collected from vertical holes in muddy sand of the inside beach at Capon, January 30, 1908, by Dr. R. E. Coker, at that time fishery expert to the Peruvian government. The species has since been taken at the island of San Lucas, Gulf of Nicoya, Costa Rica, by M. Valerio, January 15, 1930; and again at Playa Blancas, Costa Rica, by the Hancock Expeditions, February 8, 1935.

*Size:* The type is about 24 mm. long, the specimen from the Gulf of Nicoya a few mm. shorter, while the one from Playa Blancas is smaller, measuring 18.2 mm. long exclusive of the incomplete rostral plate.

*Remarks:* From the appearance of the telson, I believe that this species may be founded on the first littoral stage of a *Lysiosquilla*.

The Playa Blancas specimen, regrettably, is mutilated. It lacks the greater part of its frontal appendages, the eyes and anterior portion of the rostral plate, and all but the most proximal portion of the antennal peduncles. The raptorial dactylus is armed with 11 teeth including the terminal one, as it is also in the type of the species, where the terminal one was not included in the original count on which the name of the species was based. This Playa Blancas specimen, although smaller than the type, has a small spiniform denticle intervening between each pair of the first 3 teeth or spines of the hinder margin of the telson counting from the lateral margin, as represented in the accompanying sketch of the underside of its telson. It is a male; the type is of the opposite sex; whether this fact or the relative age or development of the 2 specimens accounts for the difference in armature, I am unable to say.

### ***Lysiosquilla maculata* (Fabricius)**

*Lysiosquilla maculata* Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 111, pl. 8, figs. 86-91, 1913, and synonymy. Kemp, Philippine Jour. Sci., Vol. 10, No. 3, Sec. D, p. 174, 1915. Sunier, Contrib. Faune Indes Néerl., Vol. 1, fasc. 4, p. 72, fig. 4, 1918. Edmondson, Occas. Paps. Bishop Mus., Vol. 7, No. 13, p. 292, figs. 1c, 1d, 1921. Roxas and Estampador, Nat. App. Sci. Bull., Univ. Philippines, Vol. 1, No. 1, p. 110, 1930. Komai, Annot. Zool. Jap., Vol. 17, Nos. 3, 4, p. 269, 1938.

*Distribution:* A shallow-water species with "a wide Indo-Pacific distribution extending from Japan and Oceanica to South Africa"

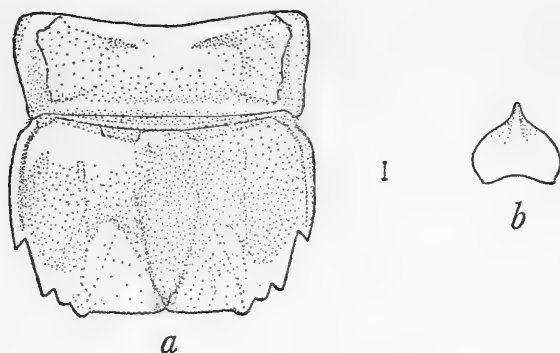


Fig. 21. *Lysiosquilla maculata*, female, from La Libertad, Ecuador (Hancock Exped. Sta. 17-33, January 20, 1933). *a*. telson and 6th abdominal somite; *b*. rostral plate (*a* and *b* magnified alike).

(Kemp); Atlantic (Stebbing [?]; and Monod as the var. *sulcirostris* Kemp). Although not previously found east of the Marquesas or Hawaiian Islands, it is here recorded from La Libertad, Ecuador, where 2 specimens, male and female, were dipped from the surface by Mr. Fred Ziesenhenne while using an electric light off the ship's gangway, January 20, 1933 (Hancock Exped. Sta. 17-33).

The "foot long" specimen which Stebbing<sup>60</sup> received from Antigua, B.W.I., has all the earmarks of a large specimen of *L. scabricauda*, especially as regards the spinulation of the hind margin of the 5th abdominal somite, and both anterior and posterior margins of the 6th, in the marginal armature of the telson, and "in not having the rostral point produced." Whether the surface of the telson was scabrous or not is not mentioned. Some specimens of *L. scabricauda* have the surface of the 6th abdominal somite almost wholly smooth except for some low, not particularly conspicuous, granulations toward either posterior lateral portion of the dorsum, and the telson not conspicuously roughened, although granulated for a considerable part of its surface like posterior parts of the 6th somite; the median raised area of the telson is always smooth, even in otherwise very scabrous specimens of *scabricauda*. I am inclined to think that Stebbing's specimen is a rather smooth-telsoned specimen of *scabricauda* instead of one of *L. maculata*. The marginal spinulation of the 5th

<sup>60</sup> South African Crust., Part 2, p. 48, 1902.

and 6th abdominal somites and the short median point of the rostral plate are just as distinctly specific of *L. scabricauda* as the scabrous telson.

Monod,<sup>61</sup> however, is very definite about his record of the occurrence of *L. maculata* in the Atlantic off the west coast of Africa, in the form of the variety *sulcirostris* Kemp.<sup>62</sup> In all, I have seen 19 specimens from the Hawaiian Islands, Samoa, the South- and Indo-Pacific, and La Libertad, Ecuador, but never a specimen from Atlantic waters, from which the National Museum representation of crustacea is extensive.

*Size:* This species attains a considerable size. Roxas and Estampador record a Philippine specimen of 385 mm. (15.16 inches) in length. The specimens from La Libertad, Ecuador, are, exclusive of rostral plate, about 90 and 100 mm. long on the median line for the female and male, respectively.

*Remarks:* Both La Libertad specimens have 11 teeth on the raptorial dactylus, including the terminal one; the first or proximal tooth of each of the dactyls is very small and inconspicuous and, with increase in size and maturity, very likely disappears. The submedian portions of the hinder margin of the telson in these specimens are finely crenulate, scarcely denticulate. The dorsum of the telson is eroded or pitted in its hinder lateral portions, but the prominence of these markings varies; as Kemp has it, "on either side is a large oval patch of more or less regularly disposed pits which are in some cases scarcely visible, but usually are specially conspicuous in the neighborhood of the lateral and antero-lateral margins." Laterally, the dorsum of the 6th abdominal somite is somewhat wrinkled or shallowly sculptured, with a slight nodular swelling either side toward the posterolateral angles of the somite. In the female these swellings are a little better developed than in the male, the one on the left side even to the extent of forming a small, low, blunt, yet not very noticeable, tubercle.

Typical *maculata* will have from 9 to 11 (usually 10, very rarely 9) teeth on the raptorial dactylus. The specimen of least size in the National Collections is one of 114 mm. in median length and, like the Ecuadorian specimens, it has 11 dactylar teeth, but the submedian portion of the hind margin of the telson is smooth and entire. Any crenulation of the hinder margin is most likely due either to individual variation or to the degree of maturity attained by the specimen in question, rather than of varietal significance.

<sup>61</sup> Bull. Soc. Sci. Nat. Maroc, Vol. 5, No. 3, pp. 88, 91, 1925.

<sup>62</sup> Mem. Indian Mus., Vol. 4, No. 1, p. 116, pl. 8, figs. 92, 93, 1913.

**Lysiosquilla desaussurei** Stimpson

*Squilla scabricauda* de Saussure, Rev. Mag. Zool. (2), Vol. 5, No. 8, p. 367, 1853.

*Lysiosquilla desaussurei* Stimpson, Boston Jour. Nat. Hist., Vol. 6, p. 503, 1857. Miers, Ann. Mag. Nat. Hist. (5), Vol. 5, p. 8, 1880. Bigelow, Proc. U.S. Nat. Mus., Vol. 17, No. 1017, p. 504, 1894 [in key only]. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 203, 1913 [listed only].

*Distribution:* The species was based on a specimen from Mazatlan, Sinaloa, west coast of Mexico, and seems never to have been taken again.

*Size:* No measurements of the unique original specimen were ever published.

*Remarks:* This species, if distinct, is very close to *L. scabricauda*. It may not, after all, be different.

De Saussure, upon comparing the specimen which Stimpson later named for him with some individuals of *L. scabricauda* in the Paris Museum, remarked that the raptorial dactylus was armed with 11 teeth, including the terminal one, and not 8, as in the Paris material. This difference is not unlike that found between males and large, well-developed females of the Indo-Pacific species of *L. maculata*.<sup>63</sup> Here the males will have 9-11 (usually 10) teeth, including the terminal one, on the raptorial dactylus, while the mature females will show but 7-8 nicks along the inner margin, in addition to the terminal tooth. However, Miers (*loc. cit.*) has already remarked that there are no secondary sex differences in *L. scabricauda*. There is nothing especially different in the armature of the raptorial dactylus between the sexes; the teeth seem to be somewhat longer and stronger in well-developed males; the propodi, however, are relatively shorter in the females. The length of the carapace, exclusive of the rostrum, in the male is not more than  $\frac{2}{3}$  the length of the raptorial propodus, while in the female the length of the carapace is  $\frac{4}{5}$  that of the propodus or more. Stated another way, in well-developed males of *L. scabricauda* the length of the longitudinal axis of the raptorial propodus is as long as the carapace plus twice the length of the rostral plate, while in the female it is rarely longer than the carapace and rostrum taken together. When longer than this, the raptorial dactylus in the female does not exceed the length of the carapace plus, at most,  $1\frac{1}{3}$  times

<sup>63</sup> Kemp, Mem. Ind. Mus., Vol. 4, No. 1, p. 111, pl. 8, figs. 86-91, 1913, and synonymy.

the length of the rostral plate. In one large female of about 198 mm. in median length, exclusive of the rostrum, the raptorial propodus was shorter than the carapace exclusive of the rostrum. This specimen, by the way, had, including the terminal one, 8 teeth on the left raptorial dactylus and 13 on the right!

I have never seen or heard of a specimen of *L. scabriceuda* from other than the east coast of America, from Florida to Brazil (except a small postlarval specimen from the surface of Vineyard Sound, Massachusetts). Balss<sup>64</sup> records its occurrence on the west coast of Africa at Toto Lome and mentions also São Thomé (Osorio) and Boutry (Guinea) (Herklots), this last, however, with the comment that he could not find this place on any chart. Thus, *L. desaussurei*, its Pacific analogue, apparently, for want of evidence to the contrary, must still be regarded as a distinct species, even though the evidence in its favor is meager. H. J. Hansen<sup>65</sup> believed *desaussurei* to be no more than a synonym of *L. scabriceuda*. It seems strange that no specimens of either have ever been turned up somewhere on the Pacific coast of America.

### *Lysiosquilla digueti* Coutière

*Lysiosquilla Diguetti* Coutière, Bull. Soc. Philom. (9), Vol. 7, p. 174, figs. 1-7, 1905.

*Lysiosquilla digueti* Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 203, 1913 [listed only].

*Distribution:* The unique male type was collected by L. Diguett in the Bay of La Paz, Lower California. It was found living as a commensal in the burrow of a *Balanoglossus*, along with a polynoid worm, *Lepidasthenia digueti* Gravier.<sup>66</sup> The species apparently has never been seen again since the original discovery, until taken by the Hancock Expeditions, first in 1936, when a much broken, very immature male specimen, apparently in the so-called first littoral stage, was dredged on March 16 in Puerto Escondido, west side of the Gulf of California, 90 to 100 miles north of the type locality (Hancock Exped. Sta. 595-36); and again in 1938 on January 11, off San Jose Light, Guatemala, the first female specimen (Hancock Exped. Sta. 770-38).

<sup>64</sup> Crust. III: Stomatopoda, in Michaelsen, Beitr. Kennt. Merresfauna Westafrikas, Vol. 11, p. 51, 1916.

<sup>65</sup> Ergebn. Plankton Exped., Vol. 2, [Pt.] G. c., p. 79 [first paragraph], 1895.

<sup>66</sup> Bull. Soc. Philom. (9), Vol. 7, p. 160, 1905.

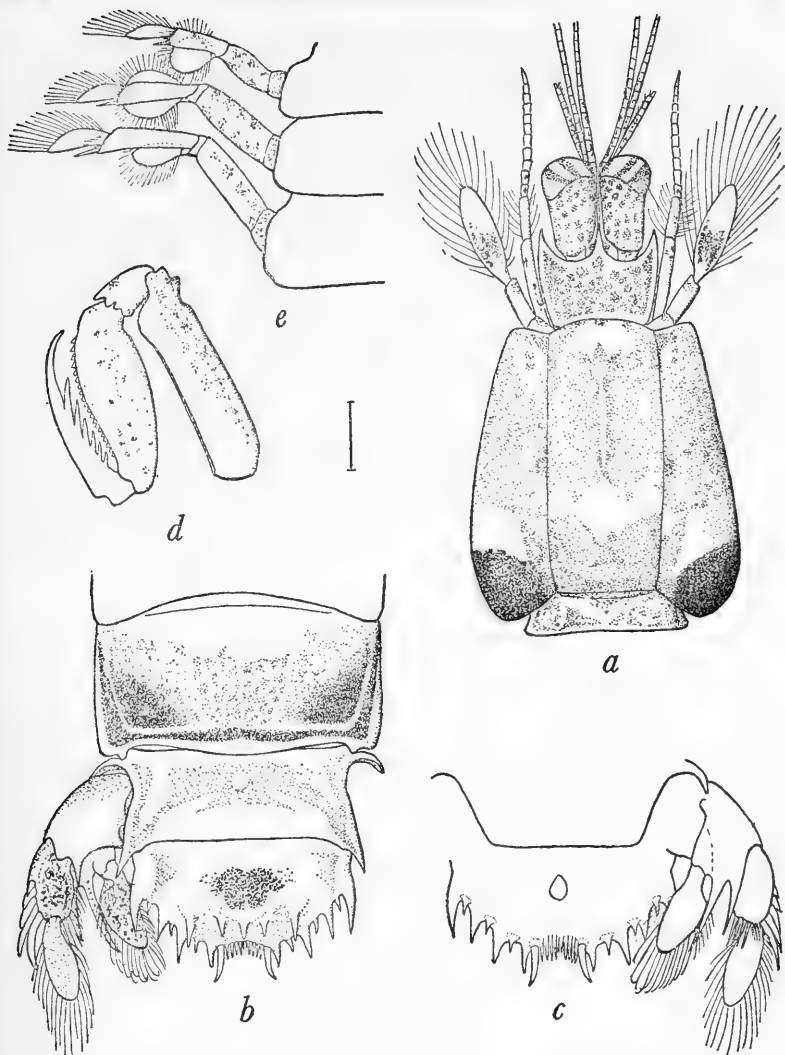


Fig. 22. *Lysiosquilla digueti*, female, from off San Jose Light, Guatemala (Hancock Exped. Sta. 770-38, January 11, 1938). *a*. anterior portion; *b*. posterior portion; *c*. ventral view of telson; *d*. left raptorial limb; *e*. last 3 thoracic limbs of left side.

In *a* the eyestalks, as compared with Coutière's representation of the type, seem to be a bit unnaturally extended, as their bases plainly show beyond the anterior margin of the rostral plate and as their corneae exceed the antennular peduncle; in the type and in the immature male from the Gulf of California the reverse is true.

This is the first indication that the species may be more widely distributed along the west coast of Mexico and Central America, from the Gulf of California at least as far south as Guatemala. As a result of its subterranean mode of life, the capture of any specimens not specifically sought for in *Balanoglossus* burrows must be very accidental.

*Color:* Coutière remarked that this *Lysiosquilla* was especially noteworthy because of the conspicuous similarity of its coloration to that of its co-commensal [*Lepidasthenia*], above whose elongated body it moves about in the *Balanoglossus* burrow in which it lives. The spots of pigment on the carapace, and particularly those of the 5th abdominal segment, imitate with great fidelity the elytrae of the polynoid in question.

*Size:* The type is 30 mm. long from the tip of the median rostral projection to the posterior extremity of the telson and is so far the largest known specimen. The broken male specimen from Puerto Escondido is a little over 20 mm. in length, rostral plate 1.1, carapace 3, abdomen and telson together 16.2 mm.; the female from Guatemala is very little larger than the juvenile male, yet the adult characters seem to be fully developed; it measures 23 mm. long, rostral plate 1.4, carapace 4, abdomen 15.7, telson 2.

*Remarks:* The female is very like the type in all particulars, and seems to differ from it only in certain minor details. All spines are sharper and more slender, especially those on the telson; also those arming the posterolateral angles of the 6th somite and the 3 rostral ones. The spines of the row of 5 spines across the dorsum of the telson above the posterior margin are more or less subequal; the median spine and those at either end of the row are about equal in size and a little stronger than the pair interposed between the outermost and median spines. There are 5 submedian denticles, or rather spinules, either side of the median line; of these 10 spinules, the median pair is less than half the size of the next adjacent pair. In the type of the species there are 3 submedian spinules either side of the median line, and the median pair, as figured, appears subequal in size to the next adjacent pair.

The dactyl of the left raptorial claw is armed with 7 spines including the terminal one, the right 6, whereas in Coutière's type, including the terminal spine, both right and left raptorial dactylus is armed with 8 spines.

The coloration of this specimen approximates that of the type very closely. The rostral plate and eyestalks are darker, being more thickly



crowded with chromatophores. The uropods have the terminal blade of the endopod well sprinkled with chromatophores, though well spaced and distinct; in the figured type these blades are without chromatophores. The dense black median area figured by Coutière is not much in evidence, although the telson has a medially placed dark patch of aggregated chromatophores. Not apparent in the type, the posterior median portion of each of the abdominal somites except the last carries a subrectangular patch of black chromatophores, in contact with the black posterior margin of each somite and extending forward from  $\frac{1}{2}$  to  $\frac{2}{3}$  the median length of the somite; before this squarish patch the middorsum of each somite is without color markings.

There are differences in the armature of the telson of the broken young male due to its immaturity. There are a greater number of low projections across the postdorsum of this specimen than there are spines in the corresponding area in the type and in the female, which is like the type in this respect. The submedian spinules of this "littoral stage" of the male between the movable submedian spines arising from the under side of the telson are 14 in number. In some ways this transverse row of submedian spines is reminiscent of that in *L. decemspinosa*, a stomatopod probably in the littoral stage. Aside from other differential characters, the two may at once be distinguished by the conformation and spination of their rostral plates. The raptorial claws of this juvenile male seem to be identical with those of the figured type. The lateral rostral teeth are slightly shorter than the median one. The shorter rami of the 7th thoracic legs are the most broadly oval, the 6th next in width, and the 8th the narrowest; in the type the shorter rami of the 8th pair of thoracic legs also appear to be the narrowest of the 3 pairs and the 7th broadly oval or subcircular.

### ***Lysiosquilla mccullochae*, new species**

*Distribution:* Known only from the unique female holotype dredged from a coralline algal bottom in 30 fathoms off San Francisco Island, Gulf of California, February 24, 1936 (Hancock Exped. Sta. 513-36).

*Size:* The type measures on the median line, exclusive of rostrum, about 32 mm., carapace 7, rostrum 1.9.

*Description:* Carapace smooth, anterolateral angles broadly rounded; the slight depressions at about  $\frac{2}{5}$  the length of the carapace from its

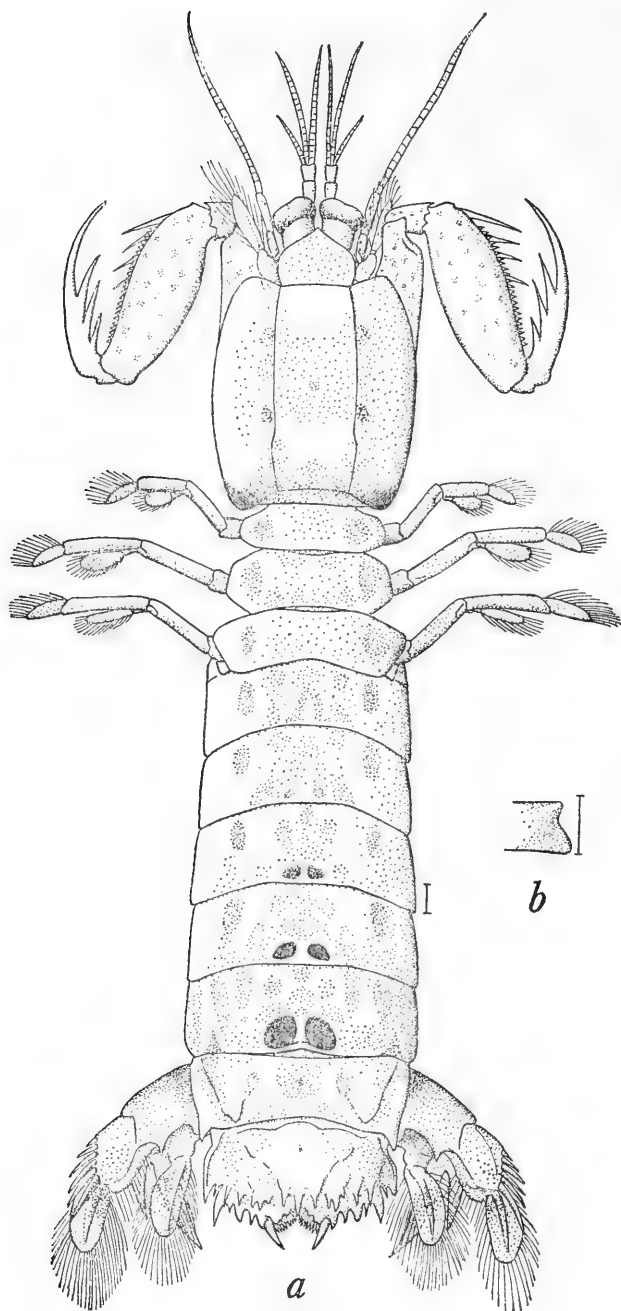


Fig. 23. *Lysiosquilla mcullochae*, female holotype, from 30 fathoms off San Francisco Island, Gulf of California (Hancock Exped. Sta. 513-36, February 24, 1936). *a*. dorsal view; *b*. right lateral margin of 5th thoracic somite in dorsal view.

posterior margin in the distinct gastric grooves are suggestive of indications of a cervical groove of which, however, there is no trace across the middorsum of the carapace. The cornea is large, wide, somewhat obscurely bilobed, and set more or less transversely on its stalk; its transverse axis is about as long as the visible portion of the median longitudinal axis of the stalk if continued across the cornea; the cornea overhangs the inner and outer borders of the stalk.

Median length of rostral plate about  $\frac{3}{4}$  its greatest width. Antennal peduncle and antennal scale each exceeding cornea and reaching about as far forward as the proximal border of the terminal segment of the antennular peduncle. Mandibular palp 3-segmented.

Upper border of the raptorial carpus not carinate, but dorsal margin terminates anteriorly in a more or less acute spine; on the inner side of the propodus below the pectinate margin are 4 movable spines, the first and longer 2 are near the carpal end, the somewhat shorter 3rd and 4th are situated at about the carpal ends of the pits in which the penultimate and antepenultimate dactylar teeth become concealed when the dactylus is tightly closed against the propodus. The dactylus is armed with 4 teeth, including the terminal one; at its base externally there are 2 lobes of which the first, or proximal one, forms almost a blunt right angle, the second is broadly rounded off. The chelae of the 3rd thoracic limbs are perhaps  $\frac{2}{3}$  the size of the 4th, while those of the 5th pair are scarcely  $\frac{1}{4}$  the size of the 3rd pair.

In dorsal view, the lateral margin of the 5th thoracic somite is plainly bilobed; the lobe at the anterolateral angle appears almost tuberculiform, while the posterolateral angle, on the other hand, is seemingly drawn out to a blunt point directed laterally downward; the margin of the 6th and 7th somites laterally are squared off. The distalmost of the 2 joints of the shorter ramus of the 5th and 6th pairs of thoracic feet is somewhat broadly ovate, the 6th more so than the 5th, while the 7th is more linear, yet bladelike, though parallel sided.

The abdominal somites are all dorsally smooth, with posterolateral angles rounded, except the 6th, which has the posterolateral angles each armed with a sharp spine, and the dorsal surface obsolescently, very shallowly and broadly corrugated longitudinally, most noticeable in the longitudinal depression near each raised-up lateral margin. There is a second, less noticeable pair of depressions, one on each side separated from its deeper corresponding lateral depression by a low, blunt, more or less longitudinal swelling.

The telson is a little more than twice as wide as long. Its dorsal surface is bluntly and obscurely carinated, showing 9 low ridges in groups of 3; a median group of 3 forming a flat subtriangular area, with a more laterally disposed group of 3 either side. The carinae of each group are provided each with a sharp posterior spine of which the longest and most prominent terminates the median carina of the telson; the first, or innermost, low broad carina of the right lateral group of three is itself broad and low and posteriorly trispinose; it is separated either side from the adjacent spines of this transverse series of spines on the dorsum of the telson by a shallow groove or depression, as are, on either side of the telson, the 2 outermost spines from each other by an even less well-marked and shorter groove. The lateral margin of the telson is a bit thickened and entire, ending posteriorly in a stout lateral tooth<sup>67</sup> or spine; one spiniform denticle removed from the lateral tooth is a stout intermediate tooth or spine, the largest and longest of the marginal teeth or spines; one denticle more and there is another spine or tooth several times larger and stouter than the spinous denticle immediately preceding; next in order on the posterior margin, moving toward the median line, are 2 more teeth or denticles, of which the more medially placed one is just external to the long, slender, movable submedian spine; on the inner side of the submedian spine is another spine or denticle, one of 9 arming the left moiety of the median notch, on the right side the corresponding spine is one of 8. Above and to the inside of the base of each submedian spine is a tuberculi-form swelling, carrying 2 little tuberclelike teeth or projections; the outermost of these tuberclelike teeth is the larger in each case and is itself more or less bidentate. Beneath, the telson is unarmed.

The bifurcate basal process of the uropods is formed of 2 stout, flattened spines, of which the inner is the thicker, being dorsally keeled along its inner margin; it exceeds the outer spine by nearly  $\frac{1}{3}$  of its own length. The outer margin of the basal segment of the exopod is furnished with 6 movable spines; the upper surface of the peduncular segment is flattened and carinated along its anterior or outer edge, as well as its posterior or inner edge of this flattened upper surface; the posterior carina ends distally in a short, subacute, possibly acute spine.

*Color:* Black markings disposed much as indicated in the accompanying figure.

<sup>67</sup> According to Kemp's most useful and convenient system of nomenclature, adhered to in this paper in most instances.

*Remarks:* In some respects this species seems to resemble *L. latifrons* (de Haan)<sup>68</sup> which, however, has a long median spine tipping the rostral plate and which, in a specimen from Nagasaki, Japan, which I have examined, has a wide, more or less evenly rounded convex arc of denticles between the movable submedian spines; this arc carries about 11 teeth to the right of a not very conspicuous median notch and 12 to the left of it; there are 4 denticles between the intermediate and submedian spines, of which one is the spine immediately adjacent to the movable submedian spine; a single denticle intervenes between the lateral and intermediate marginal teeth or spines of the telson. Beneath, the telson of *L. latifrons* has a strong, keeled, and backwardly directed spine behind the anal papilla. On the dorsal surface of the telson of *L. latifrons* the posteriorly trispinose median area is more raised and more plane than in *L. mccullochae*; to either side of the median area there are only 2 low rounded carinae, each posteriorly drawn out into a stout spine; there is also a blunt-pointed tubercle either side of the telson near its proximal margin about in line with the intermediate tooth or spine of the posterior margin. The raptorial dactylus of *L. latifrons* is armed with 6 teeth, including the terminal one.

<sup>68</sup> In von Siebold's Fauna Japonica, Crust., atlas, pl. 51, fig. 3, text, p. 222, 1894. Miers (as *L. latifrons*), Ann. Mag. Nat. Hist. (5), Vol. 5, p. 25, 1880; (as *L. brazieri*), pp. 11, 125, pl. 1, figs. 3-6. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 128, 1913.

Genus **CORONIDA** Brooks, 1886

**Coronida bradyi** (A. Milne-Edwards)

*Squilla bradyi* A. Milne-Edwards in De Folin and Périer, Fonds de la Mer, Vol. 1, Crust., p. 137, pl. 17, fig. 11, 1869.

*Coronida bradyi* Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 204, 1913, and synonymy [listed only]. Gravier, Bull. Mus. Paris, 1920, p. 115; Stomatopodes, Expéd. Sci. du "Travailleur" et du "Talisman," 1880-1883, (separate), p. 32, pl. 1, figs. 1-9, 1927.

*Distribution:* Since *Coronida bradyi* was first reported by A. Milne-Edwards from the Bay of St. Vincent, Cape Verde Islands, in 1869, no additional material had ever been noticed in literature until 1920, when Gravier described 3 specimens that had been taken by the *Talisman* in 1883, also at the Island of St. Vincent from a depth of 20 meters. He also mentioned 3 other specimens in the collections of the Paris Museum, which had been examined and determined by H. J. Hansen;<sup>69</sup> 2 from the Cape Verde Islands, and one from the island of Annobon (Anno Bom), Gulf of Guinea.

Until now, all records have been from Atlantic waters, but, as a result of the Pacific explorations sponsored by Captain Hancock, the species seems to be not uncommon in the Galapagos Islands where we dredged it off Tagus Cove, north of Charles Island, and off James Bay, James Island, in depths varying from 8 to 70 fathoms, during the month of January, 1934.

A very similar distribution is reported for the hydroid, *Streptocaulus pulcherrimus* Allman, by Dr. C. McLean Fraser in "Distribution of the Hydroids in the Collections of the Allan Hancock Expeditions."<sup>70</sup> This animal, which was originally described from the Cape Verde Islands, was discovered by Dr. Fraser in the vicinity of both Hood and Barrington Islands in the Galapagos.

*Size:* All of the specimens are small, some indeed very small, yet the largest, a female measuring 46 mm. in median length exclusive of the rostral plate and spines on the posterior border of the telson, carapace 8, rostrum about 2.1 mm., is considerably larger than the largest *Talisman* specimen recorded by Gravier, which measured 31 mm. over all, "anterior margin of rostrum to posterior extremity of telson." This is the specimen upon which Milne-Edwards' original description was based.

<sup>69</sup> Ergebn. Plankton Exped., Vol. 2, [Pt.] G. c., p. 83 [third paragraph], 1895.

<sup>70</sup> Allan Hancock Pacific Expeditions, Vol. 4, No. 4, p. 170, 1939.

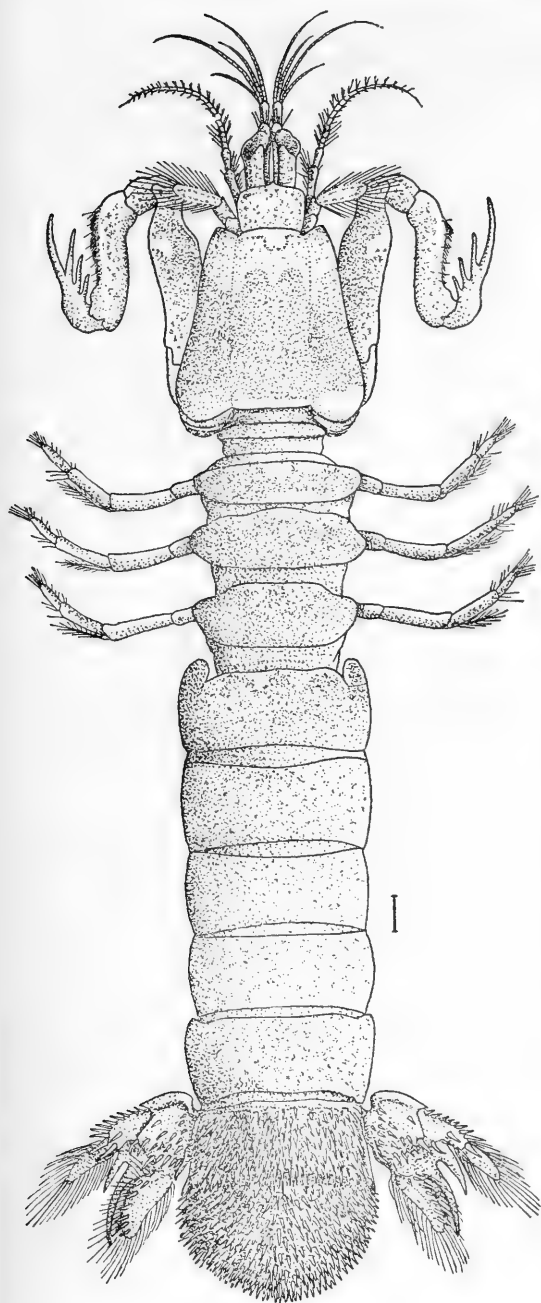


Fig. 24. *Coronida bradyi*, female, from off Tagus Cove, Albe-  
marle Island, Galapagos (Hancock Exped. Sta. 148-34, January  
13, 1934), dorsal view.

The figure has the eyestalks too slender, and the carapace is a  
little too narrow. The 3 posterior pairs of thoracic legs are stouter,  
and the abdomen tapers more anteriorly than shown; in the figure  
the epimera of the first abdominal somite have been turned out-  
ward to show their articulated anterolateral lobes.

*Remarks:* The species has been refigured and redescribed by Gravier, who also points out significant differences between it and the closely allied *C. trachura* (von Martens) from the Indo-Pacific. Through the kindness of Dr. Louis Fage, of the Paris Museum, a female specimen from off Tagus Cove was compared with Milne-Edwards' type and found to be specifically identical.

In view of the notable extension of range, in fact, unexpected occurrence of the species in Pacific waters, I have undertaken to contribute a few descriptive remarks on the largest female specimen:

Carapace smooth; gastric grooves well marked; at the end of proximal fifth of length of carapace the gastric grooves are slightly drawn together a little in advance of the faint indication of the cervical groove which does not, however, cross the middorsum of the carapace. Rostral plate subrectangular, about  $1\frac{1}{2}$  times as wide as long on median line, with small median, subacute, triangular projection. Our specimens differ from Gravier's in the distance between the cornea and the anterior margin of the rostral plate. In the Galapagos specimens the distance from the inner angle of the cornea to the anterior margin of the plate equals the distance from the anterior to the posterior margin of the plate.

The anterolateral angles of the carapace are more rounded off than angled; anterior width of carapace a little more than half its median length including rostrum; greatest width almost equals length including rostrum. In the accompanying figure the carapace has been drawn a bit too narrow. In the type the antennal peduncles reach about as far forward as the corneae; second segment of peduncle armed with a small acute spine at the anterointernal angle; antennal scale short, reaching about as far as the antennal peduncle and the corneae or slightly more. The cornea sits obliquely on the eyestalk and in thickness measures about  $\frac{1}{3}$  the visible portion of the longitudinal axis of the stalk—the eyestalks as drawn appear too slender; of the visible portion the width at the middle of the length is about half or slightly more than half the median length of the stalk with the cornea included; the transverse axis, width of the cornea about equals the visible portion of the longitudinal axis of the stalk.

The margin of the propodus opposed to the raptorial dactylus is pectinate for the greater part of its length, at its base the usual 3 movable spines are found; the dactyl is armed with 4 spines including the terminal one, outer margin of the inflated base scarcely or almost imperceptibly notched, before notch the dactyl is inflated much as in *Gonodactylus*. The



raptorial dactyli of small specimens are relatively much more inflated at the base than those of larger specimens; also in these small specimens there is a greater curvature to the thinner distal part of the dactyl which ends in the terminal spine or tooth. The chelae of the 5th pair of legs are roughly  $\frac{1}{4}$  the size of the 4th pair, the 3rd pair perhaps  $\frac{3}{4}$  the size of the 4th pair.

The first free (5th) thoracic somite is little more than a somewhat flattened ring without lateral projections and a smooth dorsal plate. The lateral margins of the smooth and shining dorsa of the 6th, 7th, and 8th thoracic somites are broadly rounded and nonprojecting, stopping short of the articulation of the leg with the somite.

The first 4 abdominal somites are smooth and unarmed; the 5th likewise, except for several small spinules on the posterior margin not far removed from the posterolateral angle; there are 4 more or less equidistant spinules on the left side of the posterior margin of the somite and 6 on the right. These spinules on the right side might be described as 4 more or less equidistant spinules, of which the first and second of the series, counting from the right, are twinned, thus making it possible to account for 6 spinules on the right side. The number of spinules present laterally on the posterior margin of the 5th abdominal somite is less in small than in large specimens, while in very small individuals they may be lacking altogether.

The entire dorsal surface of the 6th abdominal somite and telson is thickly beset with slender spines; a "comb" of small spines arms the anterior margin of the somite. The spines forming the armature of this somite increase in length from before backward, those of the posterior margin being the longest. Slightly less than the dorsal median third of the somite is thickened and raised a bit above the general surface of the somite (of course, beneath its spiny armature); this slightly elevated area is narrower behind than before; the lateral margin of the somite is raised and thickened; at its mid-point the thickened margin forms an angle or blunt tooth, while just anterior to and above the posterolateral angle of the somite the margin runs out into a strong curved spine. A few of the spines arming the somite are twinned, but there are none that can be described as stellate.

The telson beneath the spines is about  $\frac{2}{3}$  as long as wide; it is very convex and very spinous. The spines are arranged, more or less alternately, in longitudinal rows; there is a median row of spines corresponding, I should say, to the median carina of most stomatopods; the last or most posterior of this median row of spines arises from beneath the posterior

margin of the carapace; either side of this spine on the posterior margin are 2 spines followed by a movable submedian spine, I take it to be; this is nearly twice as large as any of the other spines on the telson; beyond the submedians in turn are 4 simple spines, each, as one goes away from the median line, slightly shorter than its predecessor; the next in order is the 5th spine which is twinned on either side, and between each of the twinned spines and the simple spine outside it there is a gap in the marginal series occupied by a small depression, continued on to the ventral surface of the telson as a shallow furrow. Beyond the depression along the margin of the telson are 3 spines in a row, following which the margin of the telson turns forward; around this bend the margin is unarmed, and a bit thickened or carinated; paralleling this "carina" and a bit inside it is a row of 4 spines; next there is another unarmed emargination of the border of the telson a little before the anterolateral angle of the telson; this angle is spine tipped, and just posterior to this spine at the angle is a similar one on the anterior slope of the emargination just referred to, but well back from the margin of the telson at this point.

The ventral surface of the telson is symmetrically grooved; there is a row of spines on the ventral surface at a little distance from the margin of the telson and some additional scattered spines along the sides of the ventral grooves or furrows; the ventral surface otherwise is somewhat regularly lumpy.

A pair of slender spines form the ventral process of the uropods; the outer is about one half as long as the inner and close to it, leaving a very narrow, more or less parallel-sided sinus between the 2 spines.

I observe some differences between the specimens before me and the one figured by Dr. Gravier. The eyestalks of the specimen in his figure extend a shorter distance beyond the distal margin of the rostral plate and appear medially longitudinally grooved; the telson, as depicted by Gravier, seems to have a median dorsal groove or, at least, interspace between the row of spines either side of the median line, instead of a median row of spines as in our specimens,<sup>71</sup> while the difference in relative length of the spines of the ventral process of the uropods does not appear as great nor the sinus between them as parallel sided as in our Pacific material. Never-

<sup>71</sup> A re-examination of the type by Dr. Marc André during a recent absence of Professor Fage from the Paris Museum reveals that this groove shown in the figure does not exist in fact in the type specimen; also the basal joint of the uropod is spined in the type, as in the Galapagos specimens, and not unarmed, as depicted by Gravier.

theless, I believe, as does Professor Fage (by letter), that the Atlantic and Pacific Coronidas here discussed are identical.

*Color:* In alcohol some of our specimens are of a uniform straw color (light yellow), others are mottled or more or less banded with aggregations of brown chromatophores.

Genus **GONODACTYLUS** Latreille, 1825

The several forms of *Gonodactylus* dealt with in this paper are all close allies of *G. oerstedii*. This species, in turn, is one of the many near relatives of *G. chiragra* of the Indo-Pacific, with which, indeed, it was identified for many years.

Kemp's discussion<sup>72</sup> of "*Gonodactylus chiragra* and its allies" rather fully covers the difficulties one encounters in any study of the problem of variation and speciation in this *Gonodactylus*-alliance. His remarks are of utmost value in the description of new forms within this section of the genus.

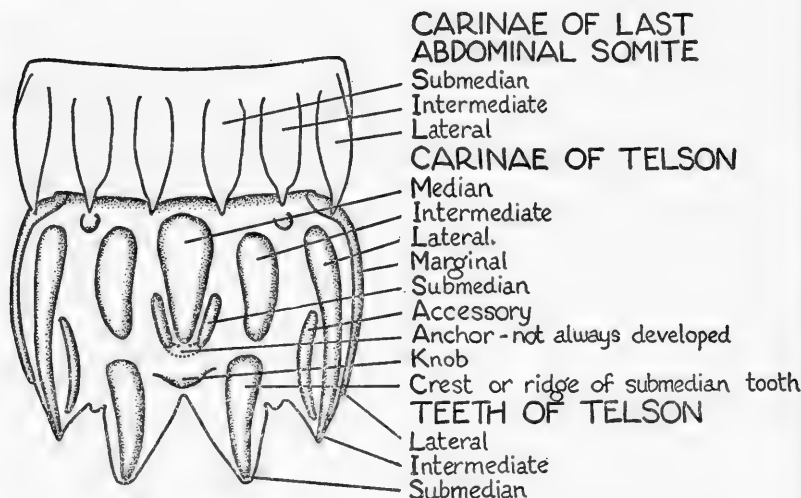


Fig. 25. Diagrammatic *Gonodactylus* telson, illustrating terms used in description.<sup>73</sup>

<sup>72</sup> Mem. Indian Mus., Vol. 4, No. 1, p. 150, 1913.

<sup>73</sup> The so-called anchor is not always formed and is often poorly developed; yet in some species it is unmistakably anchorlike in appearance.

The carina running forward or anteriorly from each submedian tooth of the hind margin of the telson is referred to as the crest, or ridge, of the submedian tooth.

The lobule, so called in the following descriptions, is the rounded, and sometimes spinule-tipped, projection intervening between the submedian and intermediate teeth of the telson margin; it is placed at the top or apex of the sinus between these teeth, when this sinus is in evidence.

The lateral tooth of the telson in many *Gonodactyli* is reduced in size and prominence; in others it may be obsolescent or not even indicated. It is usually referred to as the lateral lobe or angle rather than as a tooth, because of this reduction in size.

# Key to Species of *Gonodactylus* Known from the Pacific Coast of America

- A<sup>1</sup>. Telson without spines or spinules on upper surface except occasionally a small point or "bead" on the hinder end of the median and intermediate carinae; submedian carinae, if indicated at all, unarmed.

Knob smooth and rounded, low. Crests of submedian teeth of telson without spines or spinules. Ocular plates usually squarish with more or less convex anterior margin, almost subcircular at times. Anterolateral angles of rostral plate rounded off, not angulated.<sup>74</sup> . . . *oerstedii*, p. 211

- B<sup>1</sup>. Intermediate teeth of telson not sharply set off from submedian teeth, the lobule which typically intervenes between the submedian and intermediate teeth is placed up on outer margin of the submedian spine more or less wholly posterior to the level of the extremity of the intermediate tooth. . . .  
. . . . . *oerstedii* with Pacific type of telson, p. 211

- B<sup>2</sup>. Intermediate teeth of telson sharply and distinctly set off from submedian teeth by a sinus at bottom or apex of which the lobule separating these pairs of teeth normally occurs.<sup>75</sup> . .  
. . . . . *oerstedii* with Atlantic type of telson, p. 211

- A<sup>2</sup>. Upper surface of telson more or less spinulose, armed with spines, spinules, or prickles.

Median, submedian, and intermediate carinae usually armed posteriorly with at least one distinct spine or spinule. Crests of the submedian teeth of telson usually armed with at least one spine or spinule, often more. Anterolateral angles of rostral plate angulated, subacute, acute, or at times even spiniform (as in typical *bahiahondensis*).

<sup>74</sup> Pacific specimens of *G. oerstedii* with an Atlantic-type telson have a rostral plate with angulated, often nearly acute anterolateral angles. In this respect, these specimens approach the west coast species of *Gonodactylus* with spinulose telsons, so much so, in fact, that there is suggested the possibility that they may be a non-spinulose form if not a distinct subspecies of one or another of these species.

All Pacific *oerstedii* forms and relatives of whatever degree differ from Atlantic *oerstedii* by virtue of their usually more angulated and more produced anterolateral angles of the rostral plate. The angles in Atlantic representatives of the species (*s.s.*) are broadly rounded.

<sup>75</sup> Rarely is this sinus reduced, but when tending in this direction the lobule still definitely separates the marginal teeth and is placed so that its posterior margin lies anterior to the level of the posterior extremity of the intermediate tooth.

**B<sup>1</sup>. Knob not prominent, unarmed.**

Accessory carinae never spined, very rarely with even a small nodulation or two. Submedian crests usually armed with one spine or spinule, sometimes 2, rarely unarmed and then on one side only. Ocular plates more or less squarish, anterolateral angles somewhat produced anteriorly in some specimens, but never so markedly as in *G. bahiahondensis*. Anterolateral angles of the rostral plate produced, subacute, but never spiniform. . . . . *stanschi*, p. 215

**B<sup>2</sup>. Knob usually armed with at least one pair of small spines or spinules (see also under C<sup>1</sup> below on this point).**

Accessory carinae usually armed, at least in larger specimens, with one or more spines or spinules.

**C<sup>1</sup>. Knob armed with no more than 2 spines or spinules, only rarely and in small specimens may these be replaced by small nodules or tubercles; very rarely is there an extra, apparently adventitious, spinule on the knob of this species.**

Accessory carinae usually armed with one or 2, rarely 3, spines and then on one side only; very rarely unarmed; may be unarmed, in small specimens. Crests of submedian teeth usually armed with one or two spines. Intermediate carinae usually end in a posterior spine or spinule, usually followed by a second small spinule in line behind it; rarely is the second of the 2 spinules represented by a small bead or nodule, much more rarely does one find both so replaced. Ocular plates have anterolateral angles produced anteriorly; not appearing wider than long. Anterolateral angles of the rostral plate almost always spiniform. . . . . *bahiahondensis*, p. 217

**C<sup>2</sup>. Knob typically, and usually, armed with more than 2 spinules, very exceptionally armed with only 2, in such cases there are one or two nodules or small tubercles in addition.**

Accessory carinae armed with 3 or more spinules, rarely only 2. Intermediate carinae with several spinules in patch at or just behind posterior extremity; very exceptionally in small specimens are there only 2 spinules so placed.

**D<sup>1</sup>. Submedian carinae more or less merged posteriorly with median carina to form an anchor posteriorly or, as one might say, a coronet ornamented with from 3, usually more, up to 8 spinules.**

Knob also forming a coronet of usually 4 to 6 backwardly directed spinules, rarely only 3, sometimes as many as 7. Acces-

sory carinae usually armed with from 5 to 7 spinules. Crests of submedian teeth of telson usually armed with 4 to 7, occasionally 8 or 9 spinules in 2 rows, rarely in 3 rows. Ocular plates more or less transversely elongate, anterolateral angles laterally produced. Rostral plate with anterolateral angles sharply acute. . . . . *festae*,<sup>76</sup> p. 220

- D<sup>2</sup>. Submedian carinae of telson usually well marked and, though closely paralleling median carina, not forming so definite an anchor with it posteriorly; median carina armed with posterior spinule, as are also submedian carinae, which, counting the posterior spinule, are armed with 2 or 3 well-separated spinules in a row on the carina.

Fewer spinules in coronet arming knob, 2 to 4 occasionally with not more than one little nodule or tubercle in addition. Crests of submedian teeth of telson armed with from 2 spinules in one row to 4 or 5 in 2 rows. Ocular plates not quite typical of *G. festae* (*s.s.*), sometimes somewhat squarish. Anterolateral angles of rostral plate produced, narrowly angulate, apically blunted. . . . . *festae lalibertadensis*, p. 223

### Gonodactylus oerstedii Hansen

*Gonodactylus oerstedii* Hansen, Ergebn. Plankton Exped., Vol. 2, [Pt.] G. c., p. 65 and footnote, 1895. Bigelow, Bull. U.S. Fish Comm., Vol. 20, Pt. 2, p. 152, figs. 1, 2, 1900 (1901). Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 204, 1913. Kemp and Chopra, Rec. Indian Mus., Vol. 22, Pt. 4, p. 309, 1921. Bigelow, Bull. Mus. Comp. Zool., Vol. 72, No. 4, p. 120, 1931, and synonymy. Lunz, Jour. Elisha Mitchell Sci. Soc., Vol. 51, No. 1, p. 152, fig. 1, 1935; Bull. Bingham Oceanog. Coll., Vol. 5, Art. 5, p. 4, 1937.

*Distribution:* Atlantic: North Carolina and Bermuda to Brazil, including the Bahamas, West Indies, and Gulf of Mexico; also Fernando-Noronha. Pacific: hitherto known only from the Gulf of California, but now also from Socorro, Clarion, and Isabel islands and Tenacatita Bay, Mexico; Puerto Culebra, Costa Rica; Secas Islands and Bahia

<sup>76</sup> This species and its subspecies have a more prickly appearing telson than any of their west coast relatives. Moreover, *G. festae* is the only one in which there is almost invariably a small, sharp, slender spinule in the angle formed by the lateral lobe with the lateral margin of the carapace. There is no such spine in the subspecies, *f. lalibertadensis*.

Honda, Panama; Gorgona Island, Colombia; La Plata Island and the Galapagos Islands, Ecuador.

*Remarks:* Kemp and Chopra first made known the presence of this species in Pacific waters, in the Gulf of California. They "made a close comparison between the California specimens and others from Fernando Noronha and St. Thomas in the West Indies," but were "unable to find any appreciable difference between them."

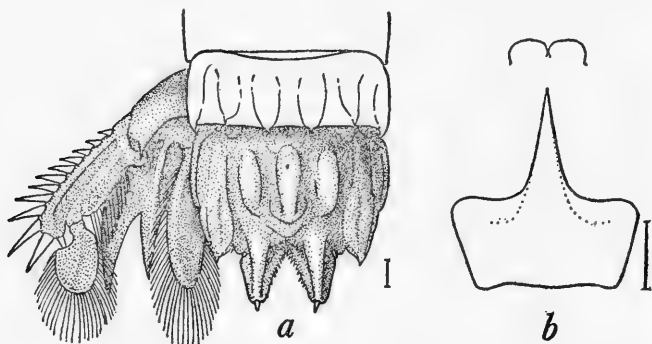


Fig. 26. *Gonodactylus oerstedii*, a female typical of the species proper, from Tortugas, Florida. *a.* telson; *b.* rostral plate and ocular scales.

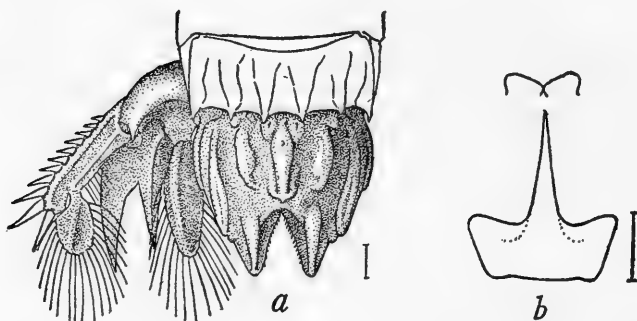


Fig. 27. *Gonodactylus oerstedii*, female with true Pacific type telson, from Darwin Bay, Tower Island, Galapagos (Hancock Exped. Sta. 98-33, February 25, 1933). *a.* telson,  $\times 5$ ; *b.* rostral plate and ocular scales.



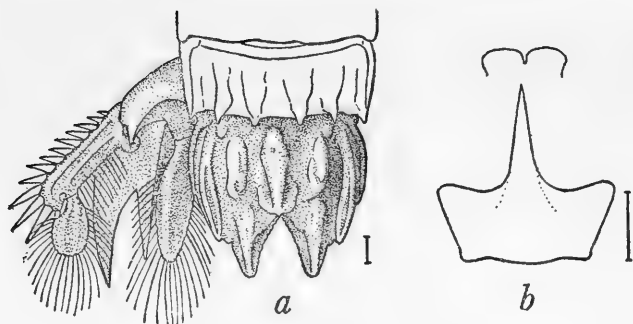


Fig. 28. *Gonodactylus oerstedii*, female, with a Pacific type telson that tends toward being intermediate between the Pacific and Atlantic type telsons, from San Gabriel Bay, Espiritu Santo Island, Gulf of California (Hancock Exped. Sta. 638-37, March 7, 1937). *a.* telson; *b.* rostral plate and ocular scales.

It is to be noted that in this specimen the lobules between the submedian and intermediate teeth of the telson are still, in part at least, posterior to the extremities of the intermediate teeth and that the axes, extended, of the submedian and intermediate teeth lie closer together than in the true Atlantic type telson. The majority of the Lower California specimens are of the true Pacific type (Fig. 27*a*) rather than of this uncommon intermediate form.

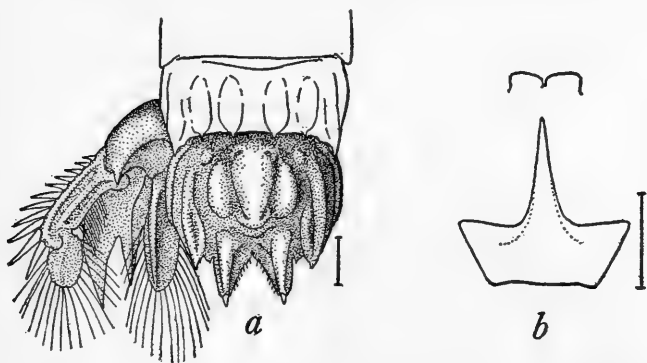


Fig. 29. *Gonodactylus oerstedii*, male, with Atlantic type telson from Academy Bay, Indefatigable Island, Galapagos (Hancock Exped. Sta. 168-34, January 20, 1934). *a.* telson; *b.* rostral plate and ocular scales.

The median carina of this specimen is more swollen than in the Tortugas specimen (Fig. 26*a*) with which it may be compared, but swelling or inflation of the carinae is of very common occurrence in all species of *Gonodactylus* (cf. Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 150, 1913).

Atlantic and Pacific specimens of *G. oerstedii* are much alike. Yet, in an extensive series from both oceans, the vast majority, with rare exceptions, of the Pacific representatives of the species has a common type of telson which, for purposes of reference, is here distinguished as the Pacific type, as compared with an Atlantic type. Rarely does any Atlantic representative of *G. oerstedii* tend to exhibit any inclination toward developing the Pacific type of telson. However, there are enough specimens, although very few with the opposite type in the waters of each ocean, to preclude, at least in the light of our present knowledge, giving them a more definite nomenclatorial status than here attempted.

The Atlantic type of telson has been well figured and described by Bigelow (1901, p. 152, fig. 1). There is a distinct, wide, V-, almost U-shaped notch or interval between the submedian and intermediate teeth of the telson margin; in the apical angle of this notch there is a well-developed lobule anterior to the level of the extremity of the intermediate spine. Very rarely is the posterior margin of this lobule on, or does it approach, the level of the extremity of the intermediate tooth. In these rare cases the notch or interval between the submedian and intermediate teeth tends to become more or less obliterated, and the outer margin of the submedian tooth and the inner of the intermediate tooth where they proximally approach one another are separated by little more than the width of the intervening lobule. In all cases, however, there is always a noticeable offset or separation between the major (longitudinal) axes of both teeth, even though the trend of both may be more or less parallel. In no case is the lobule situated up on the outer margin of the submedian tooth wholly behind or posterior to the level of the extremity of the intermediate one.

In the Pacific type of telson, the interval between the intermediate and submedian teeth is wanting and the lobule that separates the intermediate from the submedian tooth in the Atlantic forms is less distinct and scarcely more, in many cases, than an irregularity of the outer margin of the submedian tooth just before it passes over into the outer margin of the rudimentary intermediate tooth. This reduced lobule is so placed that it is situated posterior to the level of the extremity of the intermediate tooth. I have seen one Pacific specimen in which a part, but not the whole, of this lobule seemed to be behind the level of the extremity of the intermediate tooth, but this is no doubt of exceedingly rare occurrence. A lobule which is part before and part behind the intermediate tooth is also to be seen in some of the small and near juvenile Atlantic specimens of *G. oerstedii*. Thus we see in some of the small specimens on both coasts some conver-

gence, but here again Kemp's remarks, cited under the generic heading above (p. 208), are in a measure applicable. These "convergent" specimens do differ in the relative perpendicular distance between the parallels formed by the major axes of the submedian and intermediate teeth extended.

The major (longitudinal) axis of the intermediate tooth in the Pacific type telson, if extended, runs very close to that of the submedian spine, and is removed from it usually by not more than the width of its crest or carina at the level of the lobule. In the Atlantic type of telson the perpendicular distance between the lines extending the axes of the submedian and intermediate teeth is about as great as half the width of the entire submedian tooth, crest included, at the level of the posterior margin of the intermediate lobule, or more.

The relation that the Pacific type telson bears to the Atlantic type is very like that borne to *G. demani* by its variety *spinusus* in which the intermediate teeth of the telson are rudimentary as compared with those of the species proper.

### *Gonodactylus stanschi*, new species

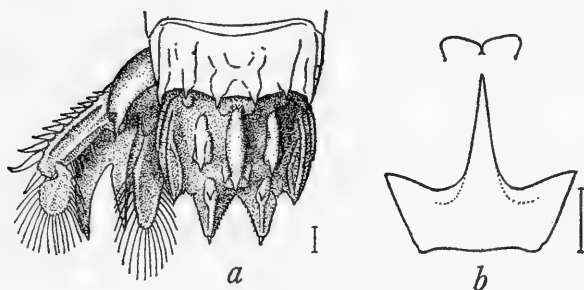


Fig. 30. *Gonodactylus stanschi*, female holotype, from Tangola-Tangola, Mexico (Hancock Exped. Sta. 261-34, March 1, 1934).  
a. telson; b. rostral plate and ocular scales.

**Distribution:** From the Gulf of California, Angel de la Guardia Island, to Tangola-Tangola Bay, Mexico, including Isabel and Tres Marias Islands.

The existence of this species was first brought to my attention in 1926 by specimens collected that year by Dr. Carlos Stansch, inspector in the

service of the Direccion Forestal y de Caza y Pesca, Mexico, for whom I take pleasure in naming it. Dr. Stansch secured 2♂ from coral banks in the vicinity of the lighthouse, Tres Marias Islands, and 1♀ from oyster beds at Teacapan, state of Sinaloa. Otherwise, the species is known only from specimens collected by the Hancock Expeditions.

*Type:* The second largest specimen, a female of 38 mm. in median length exclusive of the 3 mm. rostrum, from Tangola-Tangola Bay, Mexico, March 1, 1934 (Hancock Exped. Sta. 261-34), has been selected as the type (U.S.N.M. No. 76355).

*Description:* One of the *Gonodactylus oerstedii*-group with dorsally spined or spinulose telson, but differing at once from its near allies by the complete absence of spinules on the accessory carinae, by the unarmed and relatively inconspicuous knob more or less underneath the hinder end of the median carina, and by the fact that the intermediate carina normally and usually ends posteriorly in a single spine; rarely is the spine terminating this carina followed by a second and smaller one. Occasionally one or the other, more rarely both, of the accessory carinae show one or two small nodulations, but never spines.

Only the posterior portions of the submedian carinae are developed; they form, as it were, the flukes of the anchor of which the median carina forms the stock (not so well marked as in some species); the median and submedian carinae are posteriorly spined (the "anchor" is thus trispinose); the spines terminating the submedian carinae are often strongly exserted and upturned, while the median spine, always the larger of the three, is inclined downward. The spines terminating the intermediate carinae are typically larger and stouter than those on the submedian carinae and about the size of the one arming the median carina.

The submedian and intermediate marginal teeth of the telson are well separated by a distinct notch, as are the corresponding teeth in specimens of *G. oerstedii* with the typical Atlantic type telson.

The crests or carinae of the submedian teeth of the telson are typically armed with but a single spine; in perhaps a fourth of the specimens there are 2 spines on one of a pair of submedian crests, the other having but a single spine or the faint indication in one instance of a slight nodulation, and in another 2. In all other specimens a single spine armed this crest, paired in almost every instance with another single spine on the corresponding crest of the opposite side of the telson; in 3 specimens one of these spines was represented by a small nodule, and in only one specimen was there a nodule on each side instead of a spine.

In some of the smaller specimens the lateral tooth or lobe is obsolescent or but barely indicated; in the larger specimens at hand it is well marked but blunt.

The anterolateral angles of the rostral plate, although more prominent and angulated than in *G. oerstedii* with Pacific type telson, are nevertheless somewhat blunt in many of the specimens; in a number, as for instance the specimen taken for the holotype, they are subacute, but never spiniform as in *G. bahiahondensis*.

The ocular plates, dorsal processes of the ophthalmic somite, somewhat resemble those of *G. bahiahondensis*, but appear to be more squarish. They do not seem to be particularly distinctive of the species, nor do I find anything especially characteristic about the uropods that would assist in specific differentiation.

### *Gonodactylus bahiahondensis*, new species

*Gonodactylus oerstedii* var. *festae* Bigelow, Bull. Mus. Comp. Zool., Vol. 72, No. 4, p. 124, pl. 2, figs. 3, 4, 1931 (part, all but synonymy, and reference to specimens pertaining to works cited in the synonymy).

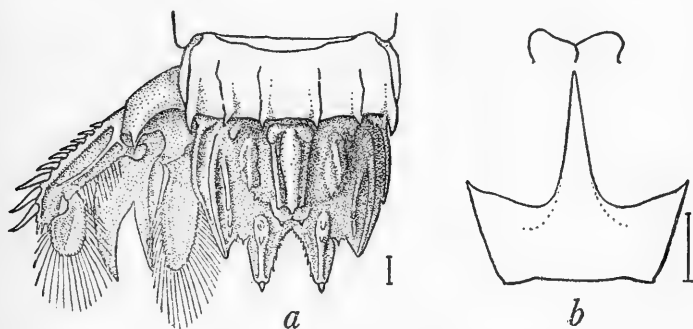


Fig. 31. *Gonodactylus bahiahondensis*, female holotype, from Puerto Culebra, Costa Rica (Hancock Exped. Sta. 258-34, February 25, 1934). a. telson; b. rostral plate and ocular scales.

**Distribution:** Puerto Culebra, Costa Rica; Bahia Honda, Secas and Perico Islands, Panama; Port Utria and Gorgona Island, Colombia; and Cape San Francisco, Ecuador. Except for a single specimen taken by

the *Albatross* October 26, 1904, at Perico Island, Panama, all of the foregoing records are based on material taken by the Hancock Expeditions.

*Type:* The largest specimen seen of this species, a female from Puerto Culebra, Costa Rica, February 25, 1934 (Hancock Exped. Sta. 258-34), has been selected as the type (U.S.N.M. No. 76349). This specimen measures 43 mm. in median length exclusive of rostrum, rostrum 3, carapace 10. This new species was first detected among the stomatopods taken the year before at Bahia Honda, Panama, and in recognition of that discovery is given its name, although the larger, better-developed specimen from Puerto Culebra has been made the type.

*Description:* A species standing close to *G. festae* Nobili, but differing from it in several characters to a degree warranting, it is believed, specific designation. Most distinctive perhaps of these characters of *bahiahondensis* are the nearly always spiniform anterolateral angles of the rostral plate and the forwardly produced anterolateral angles of the ocular plates, or dorsal processes of the ophthalmic somite.

The "knob," as we have called it, behind the median carina of the carapace, is armed with no more than 2 small spines or spinules; one in not quite a third of the specimens; in only 2 specimens were the spinules replaced by a small nodule, or pair of nodules.

The median carina of the telson is posteriorly armed with a single spine; rarely is this represented by a small beadlike or blunted protuberance. The submedian carinae, as a rule, are distinctly present and are posteriorly armed, either one or both, in the larger (half the) specimens with a single small spine; they are usually unarmed in the smaller specimens.

The intermediate carinae are posteriorly spined in nearly all the specimens; in about 4 out of the entire lot the carina is posteriorly more or less blunted off or furnished with a small "bead"; in more than two thirds of the specimens below and behind the usually spined posterior end of the intermediate carina there is a second and smaller spine, or at least, and more rarely, a small nodule (in 3 or 4 specimens) on one side or the other, usually on both sides; in only 2 specimens is the posterior terminal spine of the intermediate carina not followed by a spinule or nodulation.

The crest of the submedian tooth of the telson is armed with one or two spines; only one of the 2 crests in but one specimen was found without armature of any kind, while, on the other hand, in only 3

specimens was one of the crests armed with as many as 3 spinules, the corresponding crest of the pair having one spine in one instance and 2 in each of the others. Sometimes, in the case of 5 individual carinae among 20 odd specimens, the spine (single) arming this crest of the intermediate marginal tooth is followed by a small nodular swelling, perhaps representing an incipient or undeveloped 2nd spine; otherwise not less than half the total number of specimens had 2 spines on at least one of the two crests.

The accessory carinae are usually, or perhaps typically, armed with 2 spinules. Only in one instance did I observe an accessory carina in this species armed with 3 spinules, and then on one side of the telson only. Sometimes there may be 2 spinules followed by a nodule, or only one spinule and a nodule. In 9 specimens the accessory carinae are unarmed; these are all small specimens scarcely, if at all, exceeding 30 mm. in median length exclusive of rostrum.

The lateral teeth or lobes of the telson are blunt, in no case spined, and only wanting, or not much more than indicated, in four instances.

The anterolateral angles of the rostral plate are more truly or more nearly spiniform than in any of the species of *Gonodactylus* dealt with in this account; in only 2 specimens out of the lot are they not spiniform, subacute to acute, in only one blunt; one specimen has one angle spiniform, the other rounded, the only rounded angle found in any of the material.

The ocular plates are quite different from those of *festae*, inasmuch as the anterolateral angles are produced more or less forward instead of laterally, thus making these prominences appear no wider than long; in *G. festae* they are plainly wider than long because of the noticeably laterally produced anterolateral angles. At first I believed *bahiahondensis* represented a variety or subspecies of *festae*, but the almost invariably consistent difference in the ocular plates of the 2 forms has led me to consider them specifically distinct.

*Remarks:* On the basis of the character of the ocular plates alone, the Perico Island, Bay of Panama, specimen which Dr. Bigelow had considered representative of *G. festae* is a good *bahiahondensis*. Also, it has a two-spined "knob," and distinct submedian carinae; the crests of the submedian teeth of the telson are each armed with one spine plus the indication of a second, while the accessory carinae are armed on the one side with 2 spines or spinules and on the other with a spine and the indication of a second.

*Gonodactylus festae* Nobili

*Gonodactylus festae* Nobili, Boll. Mus. Zool. Anat. Univ. Torino, Vol. 16, No. 415, p. 53, 1901. Kemp, Mem. Indian Mus., Vol. 4, No. 1, pp. 153, 204, 1913.

*Gonodactylus oerstedii* var. *festae* Bigelow, Bull. Mus. Comp. Zool., Vol. 72, No. 4, p. 124, 1931, synonymy only (description of specimen and figs. 3, 4, pl. 2, have in the present paper been referred to *G. bahiahondensis*).

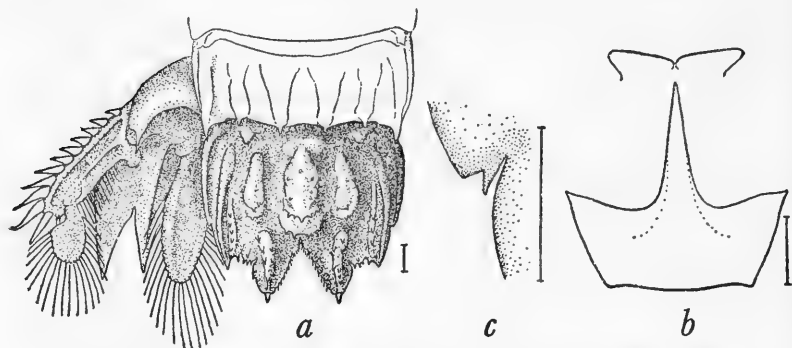


Fig. 32. *Gonodactylus festae*, female, from Salinas Bay, Costa Rica (Hancock Exped. Sta. 474-35, February 10, 1935). *a*. telson; *b*. rostral plate and ocular scales; *c*. underside of right lateral tooth or lobe to show spinule typically occurring in angle formed by the lobe with the lateral margin of the carapace, much enlarged.

**Distribution:** Nobili's original type material consisted of 2 specimens from Darien [Gulf of San Miguel, Panama],<sup>77</sup> one from Punta Santa Elena, and one from the Bay of Santa Elena, Ecuador. Since then, specimens have been obtained from as far north as Salinas Bay, Costa Rica, but not farther south than Santa Elena Bay. From between these extremes I have seen specimens both on the San Francisco Reef, Panama City, and on Taboga Island (S. F. Hildebrand, coll., February 13 and March 31, 1937, respectively); and from Bahia Honda, Panama; Port Utria and Cabita Bay, Colombia; and south of Manta, La Libertad, and Santa Elena Point, Ecuador (Hancock Expeditions).

<sup>77</sup> Boll. Mus. Zool. Torino, Vol. 12, No. 280, p. 1, 1897.



*Original description (translated from the Italian):* "This new species is related to *oerstedii* and like it has the accessory carina which distinguishes it from *chiragra*. From this and *oerstedii* [the new species] is easily distinguishable by the presence of spinules on the carinae of the telson. On the three medial carinae and on the anchor (that is found in this species as in [both] *oerstedii* and typical *chiragra*) the spinules are variable, in the two specimens from Darien reduced to tubercles, in the specimen from Punta Santa Elena very distinct. Those on the carinae [or crests] that terminate in the two [sub-] median projections [or marginal teeth or spines] of the telson, and on the accessory carinae of Hansen are most distinct, and in the case of the first named carinae form a double series.

"The rostral plate in *G. chiragra* has the external [the antero-lateral] angles muticous (f. *typica* de Man = var. A Borradaile) or acute and anteriorly produced (var. *acutirostris* de Man = var. C Borradaile);<sup>78</sup> *G. oerstedii* from St. Thomas has the external [antero-lateral] angles muticous and 'plain-like.' In *G. festae* these angles are acute, 'slender,' and anteriorly produced."

*Measurements:* The largest specimen of the species I have seen is a specimen contained in a lot collected by Dr. S. F. Hildebrand from tide pools on the San Francisco Reef, near Panama City. It is female of 49 mm. in median length exclusive of the rostrum; rostrum nearly 4, carapace 12. The figured specimen is 43 mm. long on the median line.

*Remarks:* Several of the close allies of *G. oerstedii* are known to have a spinulose telson, but none perhaps so spinulose a telson as *G. festae*, at least on the Pacific side of America. *G. oerstedii* var. *spinulosus* from Barbados and Antigua in the Atlantic most nearly approximates *G. festae* in this respect. The latter, nevertheless, is very close to *G. oerstedii* (s.s.) in the conformation of the rostral plate, the anterolateral angles of which are broadly rounded in both forms. In *G. festae*, on the other hand, they are sharply angulated and acutely pointed, although in some smaller specimens only subacute. Nevertheless, I do not know just what Nobili had in mind when he spoke of them as slender, "esili," unless he meant to indicate that in contrast to true *oerstedii* the anterolateral angles were narrowly acute or drawn out to a sharp point, as they are. All of the West American relatives of *G. oerstedii* with spinulose or dorsally spined telsons have the anterolateral angles of the rostral plate more angulated and often acute; only in *bahiahondensis* are they truly spiniform.

<sup>78</sup> In A. Willey's Zool. Res., Pt. 4, p. 401, 1899; now *G. acutirostris*, see Kemp, Mem. Indian Mus., Vol. 4, No. 1, p. 163, 1913.

Nobili's statement that the spinules arming the crest atop the submedian teeth of the telson are arranged in a double series very definitely sets his species apart from its Pacific congeners. In all but 3 (about 17 mm. in median length exclusive of rostral plate) of the specimens of *G. festae* taken by the Hancock Expeditions these spinules, numbering from 2 plus 2 nodules to 8 or 9 spinules, are arranged in 2 rows. In one of the 3 exceptions noted one crest has 7 spinules in a more or less triple series, the corresponding crest has 4 in 2 rows; the 2nd specimen has 3 spinules and a nodule in 2 rows on the one side and 5 spinules, apparently, in one row on the other; the 3rd specimen has 2 spinules in a single row on one crest, and 4 in 2 rows on its mate. In the Atlantic *oerstedii* var. *spinulosus* the spinules on these crests usually seem to be organized into 3 rows, the total number of spinules on either crest running from 5 to 7.

The accessory carinae in *G. festae* are usually armed with 4 to 7 spinules in a row, most often 4 or 5, rarely 2 or 3 plus a nodule or two; only in one instance (one carina) is there one spinule plus 2 nodules.

The knob forms a coronet armed with from 4-7 spinules or prickles—in general, prickly is the characterization one instinctively gives a *G. festae* telson. Its near relatives may have the telson spined or spinulose, but in *G. festae*, in well-developed specimens, it is definitely prickly looking, only in a very few of the smaller specimens are just a few prickles observable, but in these specimens the characters otherwise are unmistakably those of *G. festae*.

The submedian carinae of *G. festae* (*s.s.*) never seem to get beyond the anchor-fluke stage, not very long flukes at that, and very much confluent with the hinder end of the median carina. The anchor, submedians plus the median carina, is armed with 5 to 9 spinules, rarely and perhaps only abnormally less. There are also one or more little prickles, or indications of them, on either side of the median carina in advance of the anchor.

The intermediate carinae of the telson almost without exception end in a little patch of from 3 to 6 spinules or prickles in 2 or 3 short rows, just a patch of them as it were; only in some of the smallest specimens are there fewer of these tiny spinules.

Just inside the lateral tooth or lobe of the telson typically there is inserted next to the lateral margin of the telson a small but readily observable spinule. In the largest specimen the lateral lobe is wanting on the left side, and the spinule is wanting within the lobe on the right side; in only one other specimen of *G. festae* (*s.s.*) is the lateral lobe

or tooth lacking, the one on the left side; the right lobe in this case is accompanied by the usual spinule; both lobes of one small specimen lack the spinules completely; another specimen with well-developed lateral lobes has only one of the lobes spined; 10 other specimens of *festae* (s.s.) that I have seen have both lobes developed and each with the characteristic spinule. In the larger specimens either side of the median notch near its apex or origin is a tiny tubercle topped or armed with a small spinule.

Characteristic of this species are the ocular plates which have their anterolateral angles produced laterally and so appear definitely transversely elongated in contrast to those of *G. bahiahondensis*.

The one lot of specimens from La Libertad, Santa Elena Bay, Ecuador, closely related to *G. festae* yet showing some deviations from the more typical form are described below as a subspecies.

### *Gonodactylus festae lalibertadensis*, new subspecies

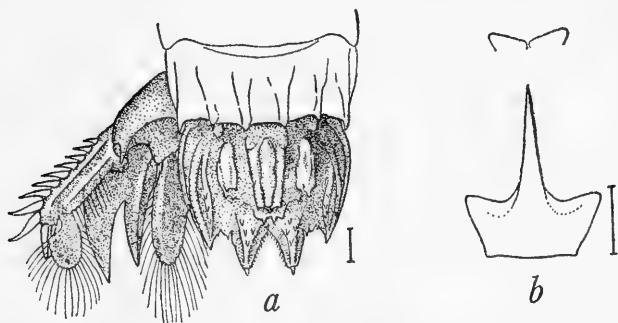


Fig. 33. *Gonodactylus festae lalibertadensis*, female holotype, from La Libertad, Ecuador (Hancock Exped. Sta. 12-33, January 19, 1933). a. telson; b. rostral plate and ocular scales.

**Distribution:** Subspecific designation is given 8 specimens, 1 ♂ 4 ♀ 3 juv., taken off La Libertad, Santa Elena Bay, Ecuador, January 19, 1933; oyster dredge in 1-2 fathoms (Hancock Exped. Sta. No. 12-33).

**Material examined:** Of these 8 La Libertad specimens the largest, a male of about 34 mm. in median length exclusive of the rostrum, does not appear quite normal, for the subspecies at least. This specimen is discussed under *Remarks* below. Three juvenile specimens under 18 mm. in

length will not otherwise be referred to. Of the remaining 4 females ranging from about 29 to 18 mm. in length, the second largest, 20 mm. in median length exclusive of the rostrum, has been selected as the type, U.S.N.M. No. 76394, as it best illustrates our concept of this subspecies.

*Description:* In the better definition and greater length of the submedian carinae of the telson this subspecies diverges from *G. festae*, and though to a small degree suggestive of *G. bahiahondensis*, it in no way resembles that species in distinctness and keeling of its carinae. In only one specimen are there as few as 2 spinules on the knob. The submedian ridges do not to the same extent go over into the formation of an anchor with the median carina as in typical *festae*. Unlike *bahiahondensis*, the submedian ridges have several spines, usually 3 in a row in the length of each submedian ridge; in the type 2.

In *bahiahondensis* the submedian carinae are armed with but a single posterior spine and have none on the ridge of the carinae in advance of the terminal one. In a number, practically all the small specimens of *bahiahondensis*, the submedian carinae are without any armature, while in no case in *lalibertadensis* do the submedian carinae have less than 2 teeth.

The knob with but one exception is armed with a coronet of spinules or prickles, as in the species proper, from 3 plus a nodule, as in the type, to 4, and 4 plus a nodule; the single exception, a small specimen, has the knob armed with but 2 spinules. The intermediate carinae have off their posterior ends, much as in typical *festae*, from 2 spines, more or less behind one another, to 5 in an irregular patch; the crests on the submedian teeth also resemble *festae*, having as many as 5 spinules in 2 rows on one side only of one specimen to as few as 2 in one row on each side; the accessory carinae were armed with 2 or 3 spinules, occasionally plus an extra nodule. There were about as many specimens of one count as the other.

In no instance was a lateral lobe or tooth furnished with a spinule, as in *festae*; in the largest of the 5 specimens discussed the right lateral lobe is wanting.

The ocular plates have some resemblance to those of *festae*, but yet were not quite typical. One of the smallest specimens, indeed, has plates somewhat resembling those of *bahiahondensis*, but it must be remembered that the characters of small and juvenile *Gonodactyli* often appear to be in the formative stage and so are not particularly positive in their specific indications.

The rostral plate is similar to that of *G. stanschi*; the anterolateral angles are anteriorly produced, somewhat narrowly angulate and apically blunt.

*Remarks:* The largest specimen of this lot of specimens from La Libertad has the median and intermediate carinae much swollen and "blown up" looking, so much so that the submedian carinae of the other specimens representing the subspecies have been completely merged in the somewhat elongated inflated structure that forms the median carina. This is armed with 3 small spinules or remnants of spinules behind, and has at least one other on either side a little behind the middle of the carina. Of the intermediate carinae each ends in a spinule and has 2 other small ones in a row behind the terminal one.

The knob has 2 spines on the left half of its posterior margin and the remains of 2 others, it appears, on the right half.

The crests of the submedian teeth are each armed with 4 spinules in 2 rows. The right lateral lobe or tooth of the margin of the telson is scarcely indicated; the left one is small and not spined.

The ocular plates of this specimen are typical of *G. festae*.

The specimen may well be an exaggerated and perhaps somewhat abnormal type of *G. festae* or else of the subspecies. It is more like *festae* than the other specimens here assigned to this subspecies and may, perhaps, be considered a transitional form linking the subspecies to the species proper.



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VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA,  
AND GALAPAGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935,  
IN 1936, IN 1937, IN 1938, IN 1939, AND IN 1940.

## A NEW GENUS AND SPECIES OF BARNACLE FROM ECUADOR

(PLATE 27)

*By* I. E. CORNWALL

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# A NEW GENUS AND SPECIES OF BARNACLE FROM ECUADOR

(PLATE 27)

By I. E. CORNWALL

Hopkins Marine Station of Stanford University

## TETRABALANUS, new genus

*Diagnosis:* Sessile barnacles, the shell having four plates; the plates forming the walls have pores which are crossed by cross-septa. Pores arranged in one row between outer and inner lamina, as in many species of *Balanus*. No epidermis could be seen on any of the specimens examined. The outer surface of the shell is smooth, and the color is white. The lower part of the inner surface is ribbed, but the ribs do not extend as far as the sheath. The lower margin of the sheath does not hang free, as the space between it and the inner lamina of the shell is filled solidly. The ribs on the interior of the shell correspond with the septa between the pores.

*Shell:* The four plates forming the shell are arranged in the same way as those of *Tetracrita*. The rostrum has radii, and is therefore a composite plate formed by the fusion of the true rostrum and the adjacent rostrolateral plates on each side of it. The carina has alae. The lateral plates have alae on one side and radii on the other. The basis is thick at the edge where it is attached to the compartments, and it is thin at the center; it has pores and is smooth on the interior surface. The basis is flat, not cup shaped as the basis of *Creusia*, as it is attached to rocks or other support.

*Terga:* The general shape of the terga resembles quite closely that of *Balanus amphitrite*, but the crests for the attachment of the depressor muscles are more regular.

*Scuta:* The scuta also resemble those of *Balanus amphitrite*.

*Type:* *Tetrabalanus polygenus*, new species.

*Distribution:* Dr. Waldo L. Schmitt collected several specimens of this genus in shore collecting at Puna Island, Ecuador, in 1934. All these specimens are attached to stones.

**Tetrabalanus polygenus**, new species

Pl. 27, Fig. 1: A, B, C, D, E, F, G, H, I, J

*Description:* A conical barnacle with four plates. The plates forming the shell are smooth, and the base adheres firmly to its support.

*General appearance:* At first sight this appears to be a very ordinary acorn barnacle, such as a smooth specimen of *Balanus crenatus*. There is no epidermis, and the surface of the parietes may be eroded in some places, so that the cross-septa in the pores are exposed. The largest specimens collected are about 10 mm. in greatest diameter, and about half that in height. The cover-plates are deeply sunken below the margin of the orifice.

*Shell:* Fig. 1: I, J. The shell is conical, with large orifice. The radii are narrow and their true shape cannot be seen unless the shell is taken apart. The interior of the shell is ribbed in the lower part, and has very much the appearance of *Balanus crenatus*, as it is attached to the basis in the same manner. The lower margin of the sheath does not hang free, since the space between it and the inner lamina of the shell is filled.

*Basis:* The basis is thick at the edge, thin at the center; it is smooth on the interior, and has fine pores.

*Scuta:* Fig. 1: G, H. The outline of the scutum is triangular, with the basal margin slightly concave. The articular ridge is high and terminates in a free point; it is half the length of the tergal margin. The adductor ridge is short and low—it looks like a continuation of the articular ridge, as its lower margin is nearly in line with the lower margin of that ridge. The pit for the attachment of the adductor muscle is large. There is no pit for the attachment of the lateral depressor muscle. The exterior of the valve is dark brown except near the occludent margin where there is a lighter band; the growth ridges are clearly marked.

*Terga:* Fig. 1: E, F. Internally the articular ridge is near the scutal margin; there are four well-developed crests for the attachment of the depressor muscle, and these crests project a little below the basal margin of the valve. Externally the valve is almost flat, and the growth ridges are not prominent. The spur is wide and is near the scutal margin.

*Maxilla:* Fig. 1: A. There is no notch below the upper large pair of spines; the spines at the lower angle are longer than those at the upper angle. As usual there are two rows of spines, but only one row is shown in the drawing.

*Mandibles:* Fig. 1: C. Each mandible has three large teeth; below these there are two small blunt teeth; the upper and lower margins bear many small spines.

*Labrum:* Fig. 1: B. There is a V-shaped notch in the middle of the labrum, with three teeth on one side, and two on the other. The outline of the labrum is about the same as that found in many species of *Balanus*, and the teeth are the same shape, and are arranged in the same way as those of *B. amphitrite*.

*Cirri:* Fig. 1: D. Cirrus I has rami of 22 and 9 segments; the lower segments are protuberant. Cirrus II has 9 and 12 spines. Cirrus III has 13 and 11 segments; several of the lower segments on the inner part are thickly set with short, conic, decurved teeth. On the outside of the posterior cirri there is one upward-pointing tooth on each of the lower segments. These teeth are near the tuft of fine spines at the upper angle. Cirrus VI has 28 and 28 segments. The median segments bear five pairs of spines.

*Penis:* The penis is longer than the sixth cirrus, and there is a point on its dorsal base.

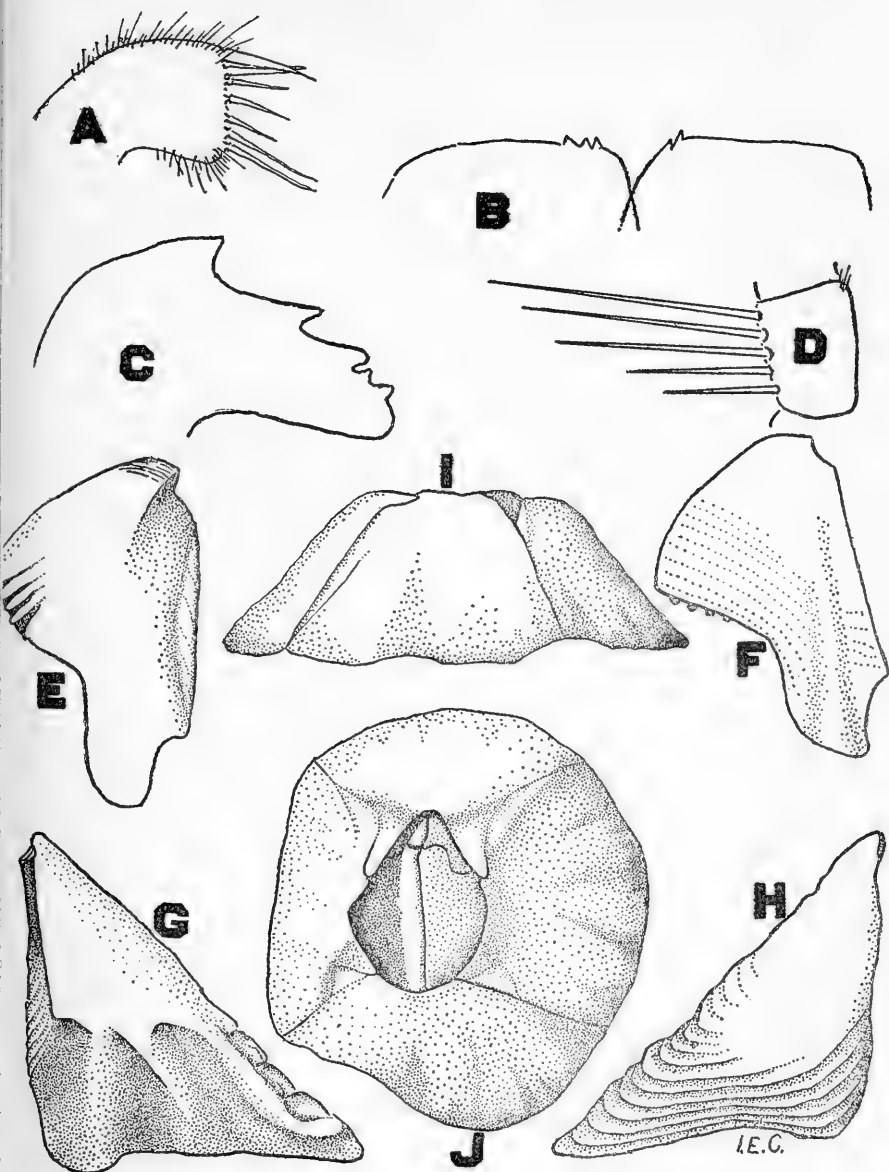
*Type:* U.S.N.M. no. 80026.

*Type locality:* Puna Island, Ecuador.



## PLATE 27

- Fig. 1. *Tetrabalanus polygenus*. A. maxilla. B. labrum. C. mandible. D. median segment of cirrus VI, showing one row of spines. E. interior of tergum. F. exterior of tergum. G. interior of scutum. H. exterior of scutum. I. side view of shell. J. top view of shell, showing cover-plates in position.





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THE NOCTUOID MOTHS OF THE GALAPAGOS  
ISLANDS FROM THE COLLECTIONS  
OF THE ALLAN HANCOCK  
FOUNDATION

(PLATES 28-31)

By A. GLENN RICHARDS, JR.



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# THE NOCTUOID MOTHS OF THE GALAPAGOS ISLANDS FROM THE COLLECTIONS OF THE ALLAN HANCOCK FOUNDATION

(PLATES 28-31)

By A. GLENN RICHARDS, JR.

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## INTRODUCTION

There are only two papers dealing specifically with the moths of the Galapagos Islands. Williams<sup>1</sup> covered the butterflies and sphingid moths and incidentally mentioned the presence on these islands of 6 other species. Schaus<sup>2</sup> published the only paper attempting to cover the moths. He listed 61 species, 24 of which were described as new. The above two papers present a listing of 78 species of Lepidoptera, though 6 were identified only to genus. The list given herein, based on material from the Allan Hancock Foundation collections, adds 6 more species. At least 3 additional species are present in the Allan Hancock Foundation material but are not reported on at this time. These make a total of 84 species with at least 3 more yet unrecorded.

The distribution of these 84 species into families is not without interest:

Phalaenidae (=Noctuidae)	40	species
Pyralidae	15	"
Sphingidae	9	"
Butterflies (4 families <sup>3</sup> )	6	"
Geometridae	3	"
Arctiidae	2	"
Miscellaneous "micros"	9	"

Many of these, at least of the first 4 groups, are strong fliers, frequently widely distributed new-world or neotropical species. Somewhat more than half of the total are such neotropical species, 34 species or races

<sup>1</sup> Williams, F. X., The butterflies and hawk moths of the Galapagos Islands, Proc. Calif. Acad. Sci., 4th ser., vol. 1, pp. 289-322, 1911. (Specimens collected by the California Academy of Sciences Expedition of 1905-1906.)

<sup>2</sup> Schaus, Wm., Galapagos Heterocera with descriptions of new species, Zoologica, vol. 5, pp. 23-48, 2 plates, 1923. (Specimens collected by the Williams Galapagos Expedition of the N.Y. Zoological Society, 1923.)

<sup>3</sup> Pieridae, 1; Nymphalidae, 3; Lycaenidae, 1; and Hesperidae, 1.

having been described as endemic. Approximately half the total number are Phalaenidae; in fact, the Phalaenoidea (Phalaenidae plus Arctiidae of this list) account for exactly half the total. Yet the really interesting feature of the list is the absence of so many tropical groups both with and without strong flying tendencies. Although half the total are Phalaenoidea, the phalaenoid families Notodontidae, Lymantriidae, Syntomidae, Pericopidae, Diopitidae, and the stronger flying Arctiidae<sup>4</sup> are absent. Also absent are the Papilio and Danaidae among the butterflies, and among the moths the whole Saturnoidea, Bombycoidea, Drepanoidea, Uranioidea, Cossidae, Castniidae, and most of the "micro" families (many of the species of which are not small). It seems truly strange that so many Phalaenidae, big and small and of many diverse groups, have reached these islands when so few other Lepidoptera have done so.

The 6 species here recorded from the Galapagos Islands for the first time are:

*Feltia annexa* (Treit.)

*Peridroma margaritosa* (Haw.)

*Peridroma* (*Peridroma*) *conwayi*, new species

*Prodenia dolichos* (Fabr.)

*Prodenia eridania* form normal *linea* (Fabr.)

*Zale* sp. of *viridans* group

These also represent the first definite records of these 4 genera.

## ANNOTATED LIST OF SPECIES

### Arctiidae

*Utetheisa galapagensis* (Wallgrn.)

*Original description*: Wien. Ent. Mon., 4: 161, 1860.

Schaus, Zoologica, 5: 23, 1923.

Cartago Bay, Albemarle Island; January 21, 1938;

J. S. Garth.

1♂ 1♀

Conway Bay, Indefatigable Island; February 15, 1933;

J. S. Garth.

1♂

James Island; January 9, 1932; J. S. Garth.

1♀

Charles Island; January 1-4, 1932; J. S. Garth.

1♀

Charles Island; 1934; H. Wittmer.

1♀

*General distribution*: endemic.

<sup>4</sup> The two Arctiidae recorded are both species of the weak-flying genus *Utetheisa*.

## Phalaenidae

## PHALAENINAE (=AGROTINAE)

*Agrotis ypsilon* (Rott.)

Williams, Proc. Calif. Acad. Sci., 4th ser., 1: 319, 1911.

Cartago Bay, Albemarle Island; January 21, 1938;

J. S. Garth.

1♂

Charles Island, elev. 1300 ft.; 1939; E. A. Conway.

1♂

*General distribution:* an almost cosmopolitan pest. On all continents, East Indies, Australia, New Zealand, Hawaii, etc.

*Feltia annexa* (Treit.)

James Island; January 9, 1932; J. S. Garth.

1♀

Cartago Bay, Albemarle Island; February 14, 1933;

J. S. Garth.

1♀

These are the first records of this species for the Galapagos Islands. Both specimens are extremely dark, almost melanic. Possibly a local race is present here. Determination checked by genitalic slide to slides of North American specimens of the species.

*General distribution:* throughout the new world.

*Peridroma margaritosa* (Haw.)

Charles Island, elev. 1300 ft.; 1939; E. A. Conway.

2♂ 1♀

This is the first record of this species from the Galapagos Islands. Determination checked by male genitalic slide to slides of North American specimens of the species.

*General distribution:* throughout the new world; also Europe, north Africa, Asia Minor, Persia, and Hawaii.

***Peridroma* (*Peridroma*) *conwayi*, new species**

Plate 28, Figs. 1-7

*Male:* Antennae three-fourths length of fore wing, bipectinate, the pectinations about three times as long as width of an antennal segment, pectinations shorter apically, the apical one fifth simple and serrate. Head and palpi as figured (pl. 28, fig. 1); the narrow scales of vertex and frons largely erect but not forming any definite tufts; palpi upturned, the third segment almost porrect. Thoracic vestiture of narrow scales and hairs, rough but with no visible tufts (specimen slightly rubbed). Legs with femorae heavily fringed with hairs; fore tibiae with single apical spine

on outer side and row of 7 moderate spines along inner side; mid and hind tibiae with moderate sex tufts on basal half; tarsi with only 3 rows of spines, none on the dorsal half of the segments. Abdomen almost smoothly scaled, no special hair tufts (sexual).

*Maculation:* Head and palpi uniform dark brown. Thorax concolorous with head, the individual scales lighter basally. Legs light brown, tibiae heavily suffused with dark scales, tarsi blackish with light brown bands. Abdomen light brown. Fore wing with the dark brown ground color concolorous with head and thorax, irrorated with black scales, the lines black (pl. 28, fig. 2); basal line indicated by patch on costa faintly connected to the slightly lighter patch in the cell; t. a. line defined on basal side by less infuscation, giving effect of preceding light line, almost erect, incurved on veins; reniform only a darker and larger blotch on the incomplete median line; t. p. line excurved on veins, defined on outer side by slightly less infuscation; 2 light points on costa beyond t. p. line; subterminal line indistinct, a slightly darker broad band as figured; terminal series of faintly darker dashes between the veins; cilia concolorous. Hind wing fuscous, somewhat lighter basally, no spots or bands, cilia brown. Fore wing on under side brownish fuscous, darker in cell where there are long hairs, lighter along inner margin. Hind wing on under side as on upper side but with barely discernible trace of postmedian line.

*Expanse:* 40.4 mm.

*Male genitalia:* (pl. 28, figs. 3-7) Uncus with long ventral lobe ("vertically bifid"), the dorsal part covered with long hairs. Subscaphium present. Vinculum large, extending anteriorly (of necessity bent in ventral mount, true outline shown by stippled line in figure 3). Juxta with large terminal spine (fig. 6). Valve with "hadenid" neck and regular corona at margin (single row of macrosetae); clavus a small setose lobe in the membrane between sacculus and juxta; clasper with swollen base, enlarged ampulla (dorsal arm) and reduced true clasper (ventral arm); digitus migrated to ventral edge of valve to form a "pollex" bearing 2 recurved macrosetae at its tip (fig. 5); sacculus swollen ventrally; transtillae well developed. Aedoeagus without spines but with one scobinate patch on vesica (fig. 7).

*Holotype:* ♂, Charles Island, Galapagos, elev. approximately 1300 ft.; 1939; E. A. Conway, collector (AHF no. 2).

The interpretation of the "pollex" of this species as the digitus migrated to the ventral margin requires explanation. Forbes (1934)<sup>5</sup> has

<sup>5</sup> *Entomologica Americana*, n. s., 14: 28-29, and plates, 1934.

shown that the usual "pollex" of agrotids is probably the true clasper which has migrated to the ventral margin of the valve. *P. conwayi* has its true clasper in the normal position though much reduced (approximately as in *Peridroma (Hemieuxoa) microstigma*, see Forbes, *l. c.*). Also the "pollex" of *P. conwayi* is quite different in appearance and association from the "pollex" of *Graphiphora*, etc., and, accordingly, seemingly not homologous with the similarly placed structure of those genera. The "pollex" of *P. conwayi* is connected by a definite line of sclerotization to the normal position of the digitus just distad to the clasper-ampulla near the costal margin of the valve. It seems logical therefore to consider this structure as the digitus. The terminal macrosetae are unique.

*P. conwayi* is a distinctive species not close to any described new world agrotid. Making comparisons with other species is difficult in the absence of close relatives. Obviously *conwayi* belongs to the neotropical *Peridroma* complex; it differs from the genotype (*margaritosa* Haw.) by the peculiar uncus, lack of spines in the aedoeagus, the digitus migrated to the ventral margin of the valve and bearing terminal macrosetae, and the generically insignificant antennal pectinations. If the "pollex" of *conwayi* were not considered the digitus, then this species would differ also in lacking a digitus and possessing a pollex, but this interpretation is not accepted by the author. Two of the above differences from typical *Peridroma*, namely, the uncus and aedoeagus, are as in the related neotropical genus *Anicla* (type *infecta* Ochs.) which is, however, different in many other structural characters.<sup>6</sup>

On the whole, *conwayi* seems closer to typical *Peridroma* than to the subgenus *Hemieuxoa* (type *rudens* Harv.), a detailed study of which is given by Forbes, *l. c.* Considering the extensive variation of this type of genitalia in the genus *Peridroma sensu latu*, it seems best not to erect a new genus or subgenus for this peculiar species but to place it in the typical subgenus of *Peridroma* and to point out its additional similarities to the closely related genus *Anicla*.

## AMPHIPYRINAE

*Platysenta ruthae* (Schaus), new combination

*Perigea ruthae* Schaus, Zoologica, 5:35, pl. 1, fig. 5, 1923.

Cartago Bay, Albemarle Island; January 21, 1938;

J. S. Garth.

1 ♂

<sup>6</sup> National Museum of Canada, Bull. 55, p. 42, fig. 20, 1928.

*Male genitalia:* as figured (pl. 29, figs. 1-2).

Determination checked by comparison with the types in the U.S.N.M. This species, like most of the other species formerly placed in the genus *Perigea*, will now fall in the genus *Platysenta* following McDunnough (1938). *P. ruthae* should be placed near *concisa* Walker, from which it differs in appearance most strikingly by the dark hind wing. It is also larger, grayer, and more contrastingly marked. The male genitalia are also close to those of *concisa* Wlk., differing principally in the details of shape of the clasper and the armature of the vesica.

*General distribution:* endemic.

*Harrisonia williamsi* Schaus

Zoologica, 5: 36-37, pl. 1, fig. 7, 1923.

Academy Bay, Indefatigable Island; January 20, 1934;

J. S. Garth.

3♂ 2♀

South Seymour; January 14-18, 1932; J. S. Garth.

1♀

South Seymour; February 18, 1933; J. S. Garth.

1♂ 2♀

Determination checked by comparison with the types in the U.S.N.M.

*Male genitalia:* as figured (pl. 30, figs. 1-2).

*Female genitalia:* (pl. 30, fig. 3) Sclerite of segment VIII fused ventrally and also fused with the sclerotized dorsal wall of the ductus bursae. Ductus bursae with only one supporting sclerite, this sclerite dorsal but curving around the lateral sides almost to meet the midventral line. Bursa copulatrix bilobed anterior to entrance of ductus seminalis, one lobe thickly covered with microtrichiae (shown by stipple), the other lobe bare.

No position beyond subfamily was given for this genus in the original description. In Hampson's artificial table *Harrisonia* will key to *Rhodocia* Hmps., which, however, in this case does probably indicate, at least in general, the proper position for the genus. The type of genitalia is that found in a considerable number of genera of "lower" Amphipyridae including the *Pyrrhia* section.

*General distribution:* endemic monotypic genus.

*Prodenia eridania* form *normal linea* (Fabr.)

Charles Island, elev. 1300 ft.; 1939; E. A. Conway.

2♂

This is the first record of this species from the Galapagos Islands. Determination checked by male genitalic slide to slides of North American specimens of this species.

*General distribution:* southern United States to Argentina.

*Prodenia dolichos* (Fabr.)

Charles Island; 1934; H. Wittmer.

1♀

This is the first record of this species from the Galapagos Islands. A distinctive and unmistakable species.

*General distribution:* United States to Argentina.

*Laphygma roseae* (Schaus), new combination

*Trachea roseae* Schaus, Zoologica, 5: 33-35, pl. 1, fig. 4, 1923.

James Island; January 9, 1932; J. S. Garth.

1♂ 9♀

Cartago Bay, Albemarle Island; January 21, 1938;

J. S. Garth.

1♂ 4♀

South Seymour Island; February 18, 1933; J. S. Garth.

1♀

Determination based on comparison with the unique male type in the U.S. National Museum, the only previously known specimen.

*Male genitalia:* (pl. 29, figs. 3-5) Valve divided longitudinally by a line of membrane; no corona; slender ampulla at base connected by line of sclerotization to the heavy clasper near apex; clavus well developed (fig. 4); 2 membranous scale pouches from base of valve. Scaphium a long sclerite forked near the base. Subscaphium strong. Vesica of aedeagus with thousands of small spines and microtrichiae arranged as figured.

*Female genitalia:* (pl. 29, fig. 6) Segment VIII swollen, membranous laterally and ventrally. Ductus bursae with the heavy sclerite at the ostium covered with microtrichiae; entrance of ductus bursae into bursa copulatrix sclerotized and covered with microtrichiae (shown by stipple in figure). Bursa copulatrix with one elongated patch of microtrichiae; swollen area leading to ductus seminalis heavily sclerotized and folded.

*General distribution:* endemic.

Most of the specimens of this species superficially resemble specimens of *Crymodes* (= *Sidemia*, = *Hadena*) *devastator* Brace, but one of the males has the characteristic appearance of a species of *Laphygma* except for its large size. The species was described from a unique male. The series now available shows definitely that there is no prothoracic tuft present and an abdominal tuft only at the base of the abdomen. These and all other structural characters including male and female genitalia are as in the genus *Laphygma* Guenée. From the known species of *Laphygma*, *roseae* differs structurally only in having strongly serrate and fasciculate antennae in the male (almost pectinate).

The genitalia are characteristic of *Laphygma* and its closest relative *Prodenia*. In fact, they are most like the genitalia of *Prodenia dolichos*

(Fabr.), but the tufting of the abdomen and the type of maculation lead the author to place *roseae* in the adjacent genus *Laphygma*.

*Roseae* is by far the largest species of *Laphygma* known, measuring 43-53 mm. in wing expanse.

*Amyna insularum* Schaus

Zoologica, 5: 37, pl. 1, fig. 8, 1923.

Cartago Bay, Albemarle Island; January 21, 1938;

J. S. Garth.

8♂ 2♀

Conway Bay, Indefatigable Island; February 15, 1933;

J. S. Garth.

1♀

Academy Bay, Indefatigable Island; January 20, 1934;

J. S. Garth.

1♀

James Island; January 9, 1932; J. S. Garth.

1♂ 2♀

Charles Island; January 1-4, 1932; J. S. Garth.

1♂

Determined by comparison with the types in the U.S. National Museum.

*Male genitalia*: Scarcely if at all different from North American specimens of *Amyna octo* Guenée.<sup>7</sup>

*General distribution*: endemic, but possibly only a race of the common new world species *octo* Gn.

## HELIOTHINAE

*Chloridea cystiphora* (Wallgrn.)

*Anthoecia onca* Wallgrn., Wien. Ent. Mon., 4: 172, 1860.

Schaus, Zoologica, 5: 23, 1923.

Cartago Bay, Albemarle Island; February 14, 1933;

J. S. Garth.

1♀

South Seymour Island; February 18, 1933; J. S. Garth.

5♂ 12♀

*General distribution*: Panama, Galapagos Islands, and possibly Hawaii.

*Chloridea virescens* (Fabr.)

Schaus, Zoologica, 5: 24, 1923.

Cartago Bay, Albemarle Island; February 14, 1933;

J. S. Garth.

1♀

Tower Island; January 19-24, 1932; J. S. Garth.

1♀

*General distribution*: United States to Argentina.

<sup>7</sup> Richards, Entomological News, 49: 94, pl. 1, 1938.



## ACONTIINAE

*Heliocontia margana* (Fabr.)

Schaus, Zoologica, 5: 25, 1923.

Conway Bay, Indefatigable Island; February 15, 1933;

J. S. Garth.

2♂

*General distribution:* southern United States to Argentina.

## PLUSIINAE

*Autographa oo* (Cramer)

Schaus, Zoologica, 5: 26, 1923.

Charles Island; 1934; H. Wittmer.

1♂

*General distribution:* United States to southern Brazil.

## CATOCALINAE

*Melipotis indomita* (Wlk.)<sup>8</sup>*Melipotis nigrescens* Williams, Proc. Calif. Acad. Sci., 4th ser.,  
1: 319, 1911.

Schaus, Zoologica, 5: 27, 1923.

Charles Island; January 1-4, 1932; J. S. Garth.

1♂ 1♀

Charles Island, elev. 1300 ft.; 1939; E. A. Conway.

1♂

Charles Island; 1934; H. Wittmer.

8♀

*General distribution:* throughout new world, at least straying generally.*Melipotis harrisoni* Schaus

Zoologica, 5: 42-43, pl. 2, fig. 15, 1923.

Cartago Bay, Albemarle Island; January 21, 1938;

J. S. Garth.

7♂ 5♀

Cartago Bay, Albemarle Island; February 14, 1933;

J. S. Garth.

1♂

South Seymour Island; January 14-18, 1932; J. S. Garth.

1♀

South Seymour Island; February 18, 1933; J. S. Garth.

3♂ 1♀

James Island; January 9, 1932; J. S. Garth.

1♀

<sup>8</sup> Description, photographs, and genitalic drawings given in revision in Entomologica Americana, n. s., vol. 19, no. 1, 1939. Food plant in U.S.: Mesquite (*Prosopis glandulosa*).

Quite close to *M. famelica* Gn., from which it differs chiefly in the heavily suffused hind wing. The male genitalia are also very close to those of *famelica*, differing only slightly in the shape of the clasper and ampulla. The female genitalia are almost indistinguishable from those of *famelica*, though the distal sclerite of the ductus bursae is somewhat shorter. Determination checked by comparison with types in the U.S. National Museum.

*General distribution:* endemic.

*Anticarsia gemmatilis* Hbn.

*Thermesia gemmatilis* Hbn., Schaus, Zoologica, 5: 27, 1923.  
Indefatigable Island; February 3, 1933; J. S. Garth. 1♂

*General distribution:* United States to Brazil.

*Gonodonta biarmata* Gn.

Schaus, Zoologica, 5: 27, 1923.  
Charles Island; 1934; H. Wittmer. 1♀

*General distribution:* neotropics.

*Epidromia zephyritis* Schaus

Zoologica, 5: 43, pl. 2, fig. 17, 1923.  
Charles Island; 1934; H. Wittmer. 1♂

A striking species, unlike anything else in general appearance. Determination checked by comparison with the unique female type; this is the first male and the second specimen known.

*Male genitalia:* (pl. 31, fig. 4) Similar to those of the common neotropical *E. delinquens* Wlk., from which it differs in the slimmer uncus, more slender valve, and most conspicuously in the absence of a definite knob on the ventral margin of the valve near the apex.

*General distribution:* endemic.

*Psorya hadesia* Schaus

Zoologica, 5: 43-44, pl. 2, fig. 18, 1923.  
Charles Island; 1934; H. Wittmer. 1♀

Determination checked by comparison with the 2 types in the U.S. National Museum, this being the third recorded specimen. In the U.S.N.M. collection this species has been placed in the genus *Smyra* Möschler. Assuming that this transfer to *Smyra* is correct, then the monotypic, endemic genus *Psorya* becomes a synonym, leaving only one endemic noctuid genus in the Galapagos Islands (*Harrisonia*).

*Female genitalia:* (pl. 31, fig. 5) Outline of the separate sclerites of segment VII omitted from figure to avoid confusion. Ductus bursae

long; from vulva to anterior end of segment VII (as mounted) membranous and covered with small microtrichiae (not indicated in figure), then becoming heavily sclerotized and appearing much twisted on account of spiral ridges of this sclerotization; near entrance of ductus seminalis again becoming abruptly membranous. Bursa copulatrix and duct leading out to just past the ductus seminalis membranous; a triangular patch of minute microtrichiae at point of constriction (area of stipple in figure).

*Zale* sp., *viridans* group

Charles Island; 1934; H. Wittmer.

1 ♂

This is the first record of any species of this genus being taken in the Galapagos Islands. Unfortunately, this is one of the most difficult genera of the family Phalaenidae. All attempted revisions are unsatisfactory. The single specimen available falls into the complex grouped under the name *viridans* Gn. in the U.S. National Museum. It does not match perfectly any specimen in the long series at the U.S.N.M., but seldom do any two specimens from different localities agree perfectly in this group. The male genitalia (pl. 30, figs. 4-9) differ in some respects from slides of Mexican specimens of *viridans* auct. in the author's collection. Chief among these genital differences is the small membranous lobe on the left valve; in my Mexican specimens this lobe is represented by only a hump or even a flat membranous area. Other differences of questionable constancy are found in the details of shape of both valves.

*Erebus odora* (Linn.)

Williams, Proc. Calif. Acad. Sci., 4th ser., 1: 319, 1911.

Charles Island, Galapagos; 1934; H. Wittmer.

1 ♂ 3 ♀

*General distribution:* neotropical but straying over entire new world.

*Anomis professorum* Schaus

Zoologica, 5: 42, pl. 2, fig. 16, 1923.

Cartago Bay, Albemarle Island; January 21, 1938;

J. S. Garth.

3 ♀

South Seymour; February 18, 1933; J. S. Garth.

1 ♂

Determination checked by comparison with types in the U.S. National Museum.

*General distribution:* endemic.

*Mocis incurvalis* Schaus

Zoologica, 5: 41, pl. 1, fig. 13, 1923.

Charles Island; 1934; H. Wittmer.

1♂ 2♀

Determination checked by comparison with the type ♂ and type ♀, which are the only other known specimens.

*Male genitalia:* (pl. 31, figs. 1-2) The seeming differences between the 2 valves are due to slight differences in the angle of mounting. The large central structure is the anellus (juxta) which forms a complete arch over the aedoeagus. Aedoeagus with microtrichiae as indicated by stipple.

*Female genitalia:* (pl. 31, fig. 3) The median part of segment VII is the sternite beneath the base of which the ductus bursae opens; the ostial pouch is additionally supported to the apex of segment VII by lateral walls, as shown in figure. Ductus bursae with 2 supporting sclerites, as shown. Bursa copulatrix evenly covered with minute microtrichiae.

#### EXPLANATION OF PLATE 28

##### *Peridroma (Peridroma) conwayi*, new species

Figure 1. Head with palpi and tongue, eye left blank. Lateral view.

Figure 2. Maculation of left fore wing.

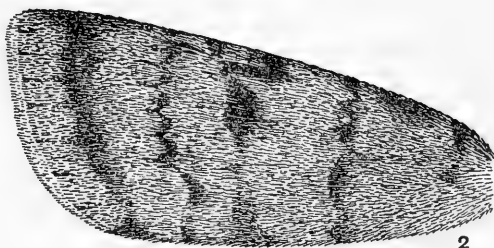
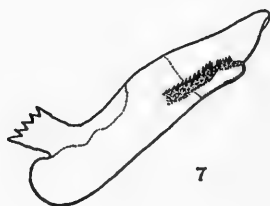
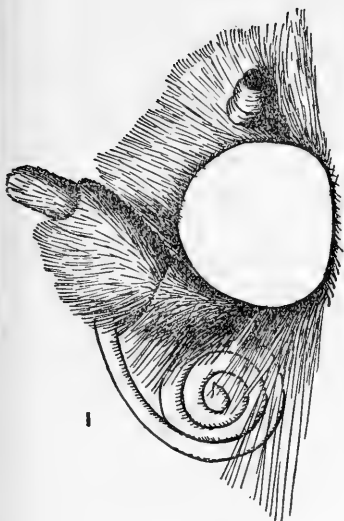
Figure 3. Entire male genitalia. Ventral view.

Figure 4. Entire male genitalia. Lateral view.

Figure 5. Enlarged drawing of digitus (=“pollex”).

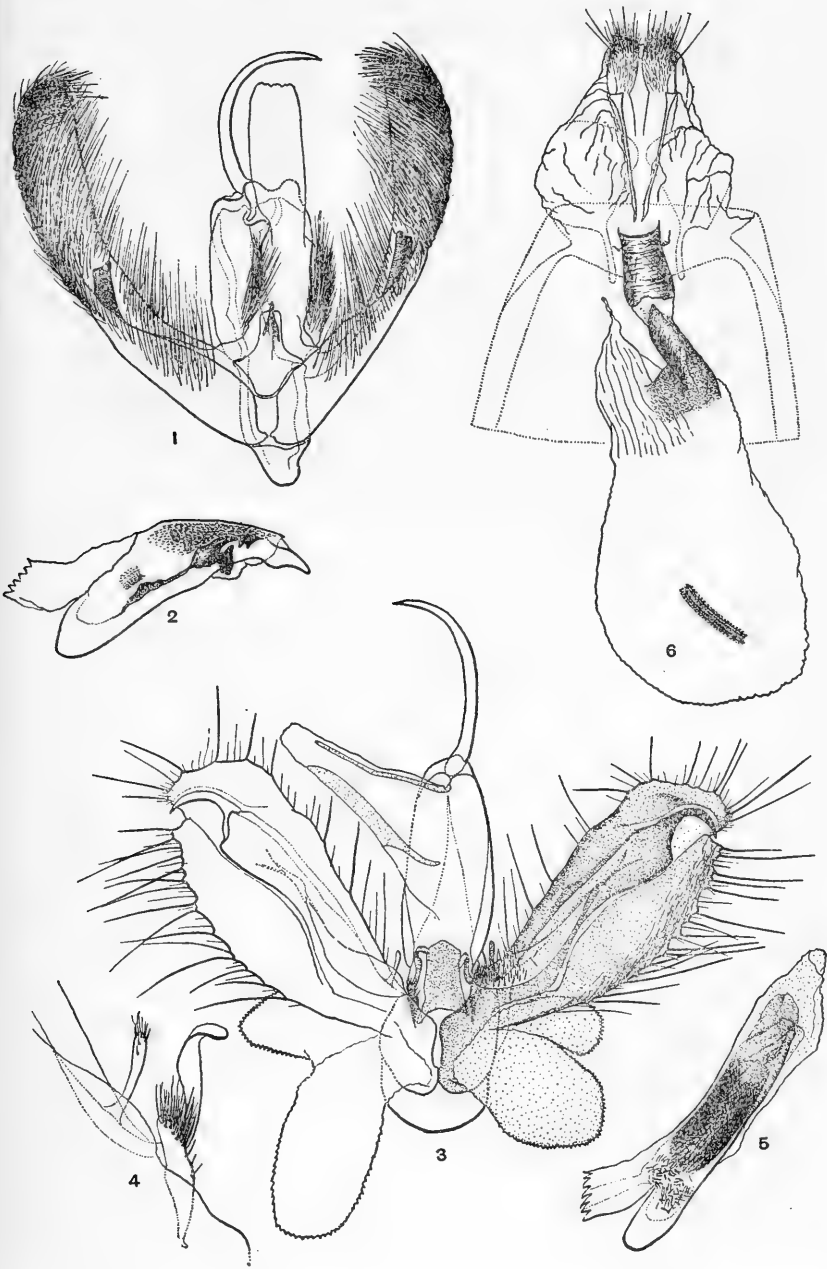
Figure 6. Enlarged lateral view of juxta.

Figure 7. Aedoeagus. Lateral view. Same magnification as figs. 3 and 4.



## EXPLANATION OF PLATE 29

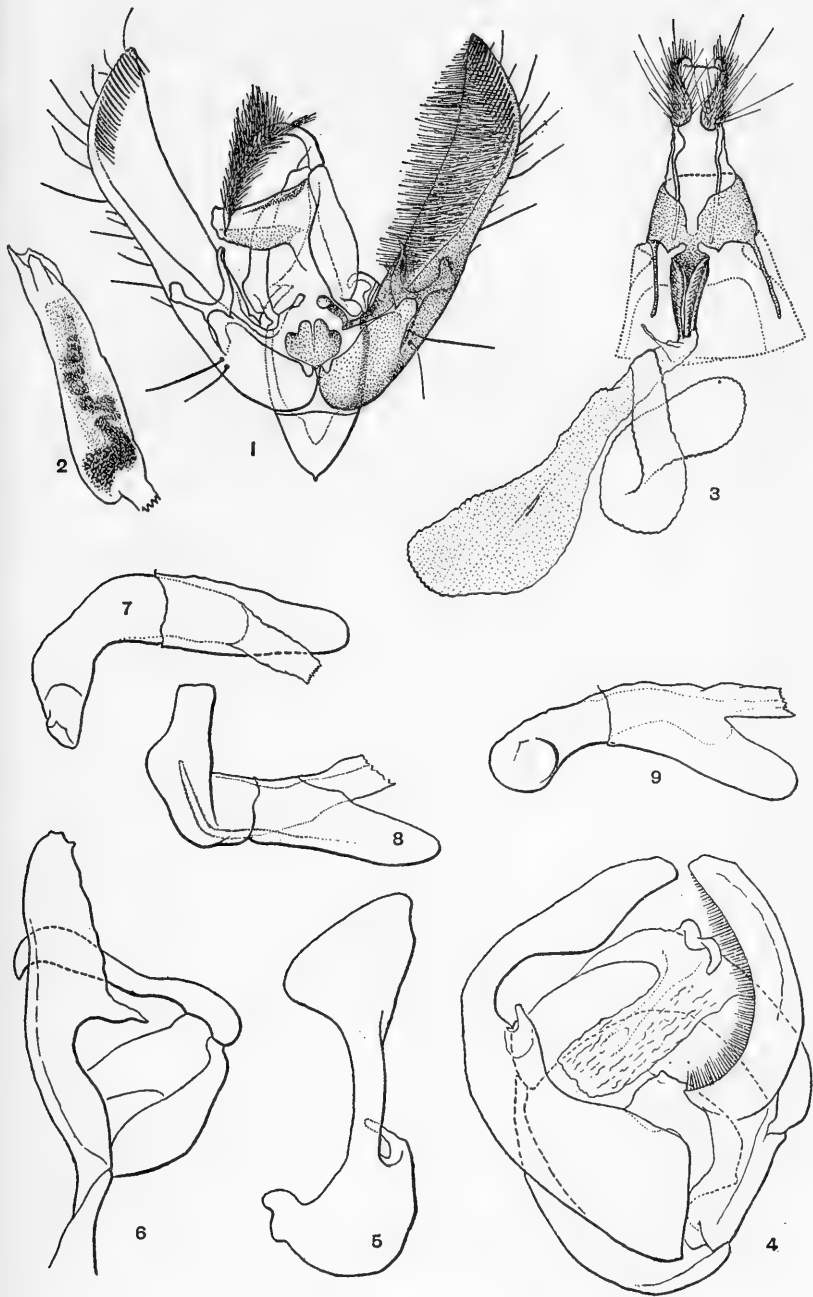
- Figure 1. *Platysenta ruthae* (Schaus). Male genitalia. Ventral view.
- Figure 2. *Platysenta ruthae* (Schaus). Aedoeagus at same magnification.
- Figure 3. *Laphygma roseae* (Schaus). Male genitalia. Ventral view.
- Figure 4. *Laphygma roseae* (Schaus). Enlarged drawing of part of left valve showing ampulla, clavus, and transtilla.
- Figure 5. *Laphygma roseae* (Schaus). Aedoeagus. Same magnification as fig. 3.
- Figure 6. *Laphygma roseae* (Schaus). Female genitalia (virgin). Ventral view.



## EXPLANATION OF PLATE 30

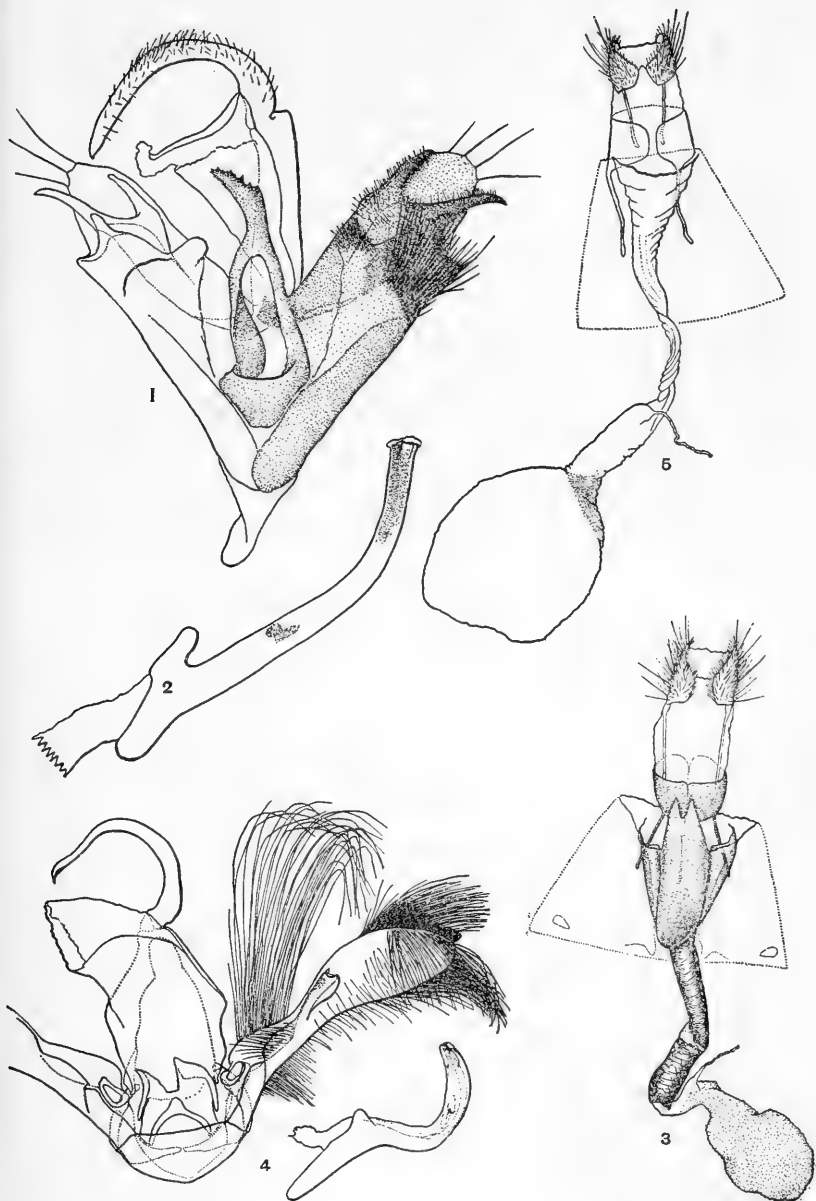
- Figure 1. *Harrisonia williamsi* Schaus. Male genitalia. Ventral view.
- Figure 2. *Harrisonia williamsi* Schaus. Aedoeagus. Same magnification as fig. 1.
- Figure 3. *Harrisonia williamsi* Schaus. Female genitalia (virgin). Ventral view.
- Figure 4. *Zale* sp., *viridans* group. Male genitalia. Ventral view.
- Figure 5. *Zale* sp., *viridans* group. Left valve. Lateral view.
- Figure 6. *Zale* sp., *viridans* group. Right valve, tegumen, uncus, and anal tube. Lateral view.
- Figure 7. *Zale* sp., *viridans* group. Aedoeagus. Dorsal view.
- Figure 8. *Zale* sp., *viridans* group. Aedoeagus. Ventrolateral view.
- Figure 9. *Zale* sp., *viridans* group. Aedoeagus. Lateral view.





## EXPLANATION OF PLATE 31

- Figure 1. *Mocis incurvalis* Schaus. Male genitalia. Ventral view.
- Figure 2. *Mocis incurvalis* Schaus. Aedoeagus. Same magnification as fig. 1.
- Figure 3. *Mocis incurvalis* Schaus. Female genitalia (virgin). Ventral view.
- Figure 4. *Epidromia zephyritis* Schaus. Male genitalia. Ventral view. Aedoeagus drawn alongside at same magnification.
- Figure 5. *Psorya hadesia* Schaus. Female genitalia (mated specimen). Ventral view.





REPORTS ON THE COLLECTIONS OBTAINED BY ALLAN HANCOCK PACIFIC EXPEDITIONS OF  
VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA,  
AND GALAPAGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935,  
IN 1936, IN 1937, IN 1938, IN 1939, AND IN 1940.

## THE GENUS *BULIA* WALKER IN MEXICO AND CENTRAL AMERICA

(Lepidoptera, Phalaenidae)

(PLATES 32, 33)

*By* A. GLENN RICHARDS, JR.



# THE GENUS *BULIA* WALKER IN MEXICO AND CENTRAL AMERICA

(Lepidoptera, Phalaenidae)

(PLATES 32, 33)

By A. GLENN RICHARDS, JR.

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University of Pennsylvania

Identification of a specimen of this group from the Allan Hancock Foundation collections as the previously unknown female of *Bulia mexicana* (Behr) has led to the examination of the genitalia of all the few known Mexican and Central American specimens of this genus. The surprising results necessitate this supplement to the author's previous revision. Full generic diagnosis is given in the 1936 papers, only the more salient features being given below.

Types of the two new species are from and therefore in the U.S. National Museum. Paratypes and authentic specimens of the other species except *morelosa* are in the Allan Hancock Foundation of The University of Southern California.

## *Bulia* Walker

1858. *Bulia* Walker, Cat. Br. Mus., Lepid., 15: 1815, pro *Biula* Walker, *l. c.*, 13: 1169, 1857. Type: *propria* Walker, sole species.
1875. *Cirrhobolina* Grote, Trans. Amer. Ent. Soc., 5: 117. Contained *deducta* Morr. and *incandescens* n. sp., the latter a synonym of the former.
- 1936a. *Bulia*, Richards, Ann. Ent. Soc. Amer., 29: 431-437, 1 pl. (revision).
- 1936b. *Bulia*, Richards, Rev. d. Ent., 6: 343, 365-367, fig. 12 (in generic revision).
1939. *Bulia*, Richards, Ent. Amer., n.s., 19:5, 69-71, pl. 5, figs. 7-14.

Palpi with long second segment which is upcurved along the frons to the vertex or slightly above; third segment porrect and twice as long as broad (1936a, fig. 4). Head of male modified, frons with small tuberculate prominence, vertex with heavy sheaths enclosing specialized scales (1936a, figs. 3-4), these sheaths normally hidden by special scale tufts from frons and vertex. Head of female normal, frons rough, rounded out and with small tuft. Thorax, wing venation, legs, and abdomen normal

for group. Male genitalia symmetrical; uncus simple; both scaphium and subscaphium present and well developed; valves strongly sclerotized except apex of cucullus; clasper and ampulla absent; sacculus with basal lobe and distal prong exceeding cucullus; aedoeagus with one or two large spines on vesica in addition to microtrichiae; eighth abdominal sternite and tergite greatly reduced; pair of long invaginated scale-pouches on segment VIII. Female genitalia with sternite VII modified with apical indentation; sternite VIII absent.

This genus now contains 6 species and one race from southwestern United States, Mexico, Central America, northern South America, and the West Indies. All of these occur in Mexico and Central America. Only one species (*confirms* Wlk.) can be identified with certainty without examination of the genitalia. The other 5 species vary greatly in color and pattern (partly sexual), but an idea of this range of variation can be had from the photographs in the author's 1939 paper. Though few specimens are known of 3 of the species, these specimens show enough intraspecific pattern differences to suggest that the wide variation known for *deducta* and *similaris* will be repeated in *mexicana*, *schausi*, and *morelosa*.

All specimens listed herein have been identified from genital slides except the unavailable types of *albina* Stkr. and part of the *confirms* series.

All the Mexican and Central American females had mated, as shown by the presence of a spermatophore in the bursa copulatrix. Fig. 6 of pl. 33 is drawn deliberately from a virgin female, and over it has been superimposed the bursa of a mated specimen (dotted line). As this shows, virgin females have a smaller, definitely wrinkled bursa copulatrix which after mating is fully distended, smooth, and considerably larger.

### KEY TO MALES

- A. Aedoeagus with only one large spine on vesica . . . . *schausi*
- AA. Aedoeagus with two large spines on vesica
  - B. Juxta with scobinate prongs . . . . . *deducta*
  - BB. Juxta with rounded or squarish margin, without any special processes
- C. Aedoeagus with spiculations on dorsal side near tip (in addition to those on vesica)



- D. Color dark, eastern, sexes alike . . . *similaris similaris*  
 DD. Color light, western, female with reduced pattern . . .  
       . . . . . *similaris californica*  
 CC. Aedoeagus without external spiculations  
 D. Distal spine of aedoeagus less than one third length of  
       proximal spine. Hind wing white . . . *confirmans*  
 DD. Distal spine of aedoeagus over two thirds length of proximal  
       spine. Hind wing with lunule yellowish *mexicana*

### KEY TO FEMALES

- A. Sternite VII deeply indented, without median prong. Hind wing  
       white . . . . . *confirmans*  
 AA. Sternite VII indented and with median prong. Hind wing with  
       lunule yellowish  
 B. Bursa copulatrix with heavily sclerotized area on side and  
       around entrance of ductus seminalis. Prong of sternite VII  
       very broad . . . . . *schausi*  
 BB. Bursa copulatrix without contrastingly sclerotized areas  
 C. Median prong of sternite VII short and very broad. Bursa  
       copulatrix weakly spined . . . . . *mexicana*  
 CC. Median prong of sternite VII narrower. Bursa copulatrix  
       heavily spined  
 D. Median prong of sternite VII long and narrow, consid-  
       erably longer than lateral lobes of sternite . . *deducta*  
 DD. Median prong not or only slightly exceeding lateral lobes  
       of sternite  
 E. Median prong relatively narrow, lateral lobes broad  
       and blunt . . . . . *morelosa*  
 EE. Median prong relatively broad, lateral lobes more  
       acutely rounded  
 F. Maculate like males, dark, eastern . . . . .  
       . . . . . *similaris similaris*  
 FF. More or less immaculate (unlike males), light,  
       western . . . . . *similaris californica*

***Bulia confirmans* (Walker)**

1857. *Bolina confirmans* Walker, Cat. Br. Mus., Lepid., 13: 1157. Type locality: San Domingo. Type: ♀, British Museum.
1857. *Bolina umbrosa* Walker, Cat. Br. Mus., Lepid., 13: 1158. Type locality: San Domingo. Type: ♀, British Museum.
1857. *Biula* (sic) *propria* Walker, Cat. Br. Mus., Lepid., 13: 1170. Type locality: San Domingo. Type: ♂, British Museum.
1936. *Bulia confirmans* (Walker), Richards, Ann. Ent. Soc. Amer., 29: 433, figs. 1-2.
1939. *Bulia confirmans* (Walker), Richards, Ent. Amer., n. s., 19: pl. 5, figs. 7-9.

A small species with the color of the hind wing white, outer margin fuscous, and anal lunule white. Photographs of types in 1939 paper.

*Expanse*: 24-30 mm.

*Male genitalia*: (pl. 32, fig. 1) Sacculus with small basal lobe and very short distal production beyond cucullus. Juxta rounded. Aedoeagus with small distal spine on vesica and no external spiculations.

*Female genitalia*: (pl. 33, fig. 1) Sternite VII deeply indented at apex, without median prong, the indentation slightly surpassed by the sclerotized ductus bursae. Spines in bursa copulatrix weak.

*Distribution*: In Central America recorded only from Costa Rica (U.S.N.M.). Also recorded from Colombia (A.M.N.H.), Venezuela, British Guiana, Marguerite Island, San Domingo, Haiti, Jamaica, and Cuba (latter all in U.S.N.M.).

***Bulia mexicana* (Behr)**

1870. *Syneda mexicana* Behr, Trans. Amer. Ent. Soc., 3: 27. Type locality: Casala, near Mazatlan, Sinaloa, Mexico. Types: both destroyed, topotypical neotype designated in following (in U.S. N.M.).
1936. *Bulia mexicana* (Behr), Richards, Ann. Ent. Soc. Amer., 29: 433.

Only 4 specimens are now known (exclusive of the lost types). The neotype is similar to typical *deducta* as figured in Ent. Amer., n. s., vol. 19, pl. 5, fig. 10, but somewhat lighter. The male from Costa Rica is much darker and similar to fig. 13, *l. c.* The female from Costa Rica is

also dark, the hind wing as in the male, the fore wing dark but with the maculation faint. The second female is lighter, the fore wing nearly immaculate except for the darker reniform and the light subterminal line; hind wing light but with broad dark band on outer margin to vein 2 ( $Cu_2$ ).

*Expanse:* 33-35 mm.

*Male genitalia:* (pl. 32, fig. 7) Sacculus with small basal lobe and short distal production. Juxta rounded. Aedoeagus with both spines large, no external spiculations.

*Female genitalia:* (pl. 33, fig. 2) Sternite VII shallowly indented and with short, broad median prong which is not longer than the lateral lobes. Bursa copulatrix weakly spined.

*Distribution:* Types (lost) and 1 ♂ neotype from Mazatlan, Sinaloa, Mexico (neotype, December 20, 1916); 1 ♂, "Avangarez," Costa Rica, July (Schaus and Barnes) (in U.S.N.M.); 1 ♀, "Avangarez," Costa Rica, June (Schaus) (in U.S.N.M.); and 1 ♀, aboard ship bound from Corinto, Nicaragua, to White Friars, Mexico (islands opposite Petatlan Bay, Guerrero), February 8-14, 1932 (John S. Garth) (in Allan Hancock Foundation, The University of Southern California).

There is some question as to the exact location of "Avangarez," Costa Rica. Presumably this is the Abangares of the Pittier map of 1903 and the American Geographical Society map of 1937, but aside from the slight difference in spelling the older map locates this town at sea level at the mouth of the Rio Abangares, while the more recent map has nothing at this location but gives Abangares about 10 miles up the Rio Abangares at an elevation of about 600 feet (approximately Long.  $85^{\circ}$  W, Lat.  $10^{\circ} 15' N$ ). Even so, both the evidence and Dr. Schaus' recollection place these specimens as from the Pacific slope at a low elevation. Mazatlan is at sea level, and of course the specimen taken aboard ship was at sea level. So all the known specimens come from at or near sea level on the Pacific slope from Mazatlan south to Costa Rica (Lat.  $23^{\circ}$  to  $10^{\circ} 15' N$ ). No other species is known near sea level in this area.

### ***Bulia schausi*, new species**

Since this species can be separated satisfactorily only by genital structure, a formal description of the maculation is not given. The holotype male is similar to fig. 10 of pl. 5 of *Entomologica Americana*, volume 19, but the fore wing is less contrasty on account of blackish suffusion, the



t. p. line is rounded around the lower end of the cell instead of being angularly produced onto veins 3 and 4 ( $M_3$  and  $Cu_1$ ), the black t.p. line is outwardly faintly defined by white scales around the cell, and the hind wing has a yellow anal lunule which does not reach the margin at its upper end. The paratype male is much lighter, the black lines accordingly more distinct, t. a. line slightly more angulate inward in submedian fold, t. p. line defined outwardly by light scales both around cell and near inner margin, and the hind wing with the border lighter and narrower, barely defining the anal lunule. The allotype female has the fore wing grayish, similar to fig. 11 of pl. 5, *l. c.*, but even less maculate, hind wing with darker and broader border. The 3 paratype females are lighter, fore wing more brownish, and hind wing with reduced border. These differences could be summarized as: the 2 Tehuacan specimens moderately dark, the 4 Orizaba specimens light.

*Expanse:* 33-36 mm.

*Male genitalia:* (pl. 32, figs. 8-10) Basal lobe of sacculus slightly bilobed; distal projection of sacculus long. Juxta short, rounded, dorso-laterally developed to above aedoeagus (giving squarish appearance). Aedoeagus with only one large spine on vesica, and no external spiculations.

*Female genitalia:* (pl. 33, fig. 3) Sternite VII similar to that of *mexicana*, but the indentation slightly deeper. Ductus bursae short and with the 2 supporting sclerites of approximately equal length. Bursa copulatrix with 3 areas of heavy sclerotization (areas stippled in figure): one a curved cone around the entrance of the ductus seminalis, one opposite this merely a sclerotized area of the bursal wall, the third on the right side terminating anteriorly in a blunt prong; the last mentioned is also covered at its anterior end with small spiculations—too small to be shown in the figure; heavy spines in bursa as shown, no set of smaller spines in the middle of the bursa on the left side.

*Holotype:* ♂, Tehuacan, Puebla, Mexico, September, 1908 (R. Muller) (in U.S.N.M.).

*Allotype:* ♀, same data as holotype (in U.S.N.M.).

*Paratypes:* 1 ♂, 3 ♀, Orizaba, Vera Cruz, Mexico, no date (ex Schaus Coll., in U.S.N.M.).

Genitally this is the most distinct of all the species of the genus, differing among other points in having only one large spine in the aedoeagus of the male, and having a short ductus bursae and heavily sclerotized areas in the bursa copulatrix of the female.

The 6 types come from two localities which are only about 35 miles apart. Mr. H. R. Roberts tells me that these are both on the margin of the central plateau of Mexico in what is generally called a subtropical area. The town name alone is not definite, as a great range of altitude occurs within a few miles; even so, these localities are well removed both from low altitudes and from deserts.

Named in honor of Dr. William Schaus, who collected the paratypes and who has done more work on neotropical Lepidoptera than any other individual.

### ***Bulia morelosa*, new species**

Fore wing gray irrorated with dark gray. Faint double basal line; t. a. line black, double; median space concolorous with rest of wing except where crossed by the darker median shade line; reniform normal; t. p. line obsolete except near costa; subterminal line light, complete, defined by preceding and succeeding darker ground color. Hind wing and under sides as usual in genus; the dark border of the hind wing of moderate width.

*Expanse*: 30 mm.

*Female genitalia*: (pl. 33, fig. 5) Sternite VII deeply indented, with narrow blunt median prong and broad squarish lateral lobes. Other features as in *deducta* and *similaris* except that the unique mated female of *morelosa* has a rounded bursa copulatrix instead of constriction into 2 regions; this, however, might conceivably be an accident of either mating or manipulation during preparation of the slide.

*Holotype*: ♀, Cuernavaca, Morelos, Mexico, June, 1906 (ex Schaus Coll., in U.S.N.M.).

The town of Cuernavaca is on the southern and Pacific slope of the central plateau of Mexico. Although only a little more than a hundred miles from the localities where *schausi* was taken, Cuernavaca differs considerably from these localities, particularly in having some surrounding desert country. In keeping with this desert habitat (where the author assumes this specimen was collected), *morelosa* comes closest to the desert species of northern Mexico and southwestern United States. Of these large series are available, and sternite VII has been examined by the author on well over 200 specimens of *deducta* and on about 30 specimens of *similaris* (including race *californica*). None of these had this short but narrow median prong, and none such broad blunt lateral lobes. These

characters plus the wide spatial separation led the author to describe this unique as new.

### ***Bulia similaris* Richards**

1936. *Bulia similaris* Richards, Ann. Ent. Soc. Amer., 29: 433-434, figs. 8-9. Type locality: San Benito, Texas. Type: ♂, in U.S.N.M.  
1939. *Bulia similaris* Richards, Ent. Amer., n. s., 19: 70, pl. 5, fig. 13.

The short type series, after segregation of race *californica*, shows a dark form in which the sexes are both maculate.

*Expanse*: 33-36 mm.

*Male genitalia*: (pl. 32, figs. 4-6) Sacculus with moderate basal lobe of somewhat variable shape, and blunt distal projection. Juxta moderate and smoothly rounded. Aedoeagus with moderate proximal spine on vesica and slightly larger distal spine; the dorsal surface near the tip covered with minute spiculations (in addition to spicules on vesica).

*Female genitalia*: (pl. 33, fig. 4) Sternite VII with relatively broad short median prong which is only slightly longer than the lateral lobes of the sternite.

*Distribution*: Texas, and Baboquivari Mountains, Arizona. Doubtless also occurs in northern Mexico, but no records are known.

### ***Bulia similaris* race *californica* Richards**

1939. *Bulia similaris californica* Richards, Ent. Amer., n. s., 19: 70-71, pl. 5, fig. 14. Type locality: Jacumba, San Diego County, California. Type: ♀, in U.S.N.M.

This is the desert race from the Pacific region. The females tend to be immaculate and light; the males are also lighter but not so strikingly so.

*Expanse*: 33-40 mm.

*Genitalia*: as in type form.

*Distribution*: Arizona, southern California, and Baja California, Mexico. From Baja California specimens have been seen from Rosarito (2 ♂, 1 ♀, paratypes), Punta Prieta (2 ♀, paratypes), and Espiritu Santo Island, March 7, 1937, John S. Garth Coll. (1 ♂, Allan Hancock Foundation Collection).

The greatest difficulty in this genus has always been and still is the separation of females of *similaris* (and *californica*) from those of *deducta*. As a rule, the median prong of sternite VII, being relatively short and

broad (*similaris*) or relatively long and narrow (*deducta*), will serve, but some specimens are more or less intermediate and so unplaceable unless accurately associated males are available. Even with males for identification, one must be careful because mixed lots from one collecting are not uncommon.

### *Bulia deducta* (Morrison)

1874. *Syneda deducta* Morrison, Proc. Boston Soc. Nat. Hist., 17: 220. Type locality: Waco, Texas. Type: ♂, in Mus. Comp. Zool.
1874. *Syneda pavitensis* Morrison, Proc. Boston Soc. Nat. Hist., 17: 220. Type locality: Waco, Texas. Type: ♀, in Mus. Comp. Zool.
1875. *Cirrhobolina incandescens* Grote, Trans. Amer. Ent. Soc., 5: 117. Type locality: Texas. Type: ♀, in British Museum.
1882. *Cirrhobolina mexicana* var. *vulpina* Henry Edwards, Papilio, 2: 14. Type locality: Prescott, Arizona. Type: ♀, in U.S. Nat. Mus.
1900. *Syneda mexicana* var. *albina* Strecker, Lepid. Rhopal. Het. Ind. and Exot., Suppl. 3, p. 35. Type locality: Chihuahua, Mexico. Types: 2 ♀, in Field Museum.
- 1936a. *Bulia deducta* (Morrison), Richards, Ann. Ent. Soc. Amer., 29: 434-435, figs. 3-7.
- 1936b. *Bulia deducta* (Morrison), Richards, Rev. d. Ent., 6: fig. 12.
1939. *Bulia deducta* (Morrison), Richards, Ent. Amer., n. s., 19: pl. 5, figs. 10-12.

Extremely large series of this species are available, and the color and pattern of the types and most of the other known specimens of the preceding 4 species can all be matched fairly closely from these series (the females of *similaris* race *californica* do have an indescribably different "feel" that frequently but not always permits their separation). Photographs given in the author's 1939 paper (figs. 10-14) indicate this extensive range of variation though giving only five of the many types of variants.

*Expanse*: 33-38 mm. usually; extremes 30-40 mm.

*Male genitalia*: (pl. 32, figs. 2-3) Sacculus with large basal lobe (somewhat variable in shape), distal projection beyond cucullus long and pointed. Juxta (fig. 3) with long scobinated prongs which are characteristic of this species. Aedoeagus with 2 large spines, the distal one about half the size of the proximal one; in addition, a patch of medium-sized spines on the vesica near the proximal large spine, and small spiculations

elsewhere on the vesica; few small spiculations on exterior of aedoeagus near tip.

*Female genitalia:* (pl. 33, fig. 6) Sternite VII with long median prong which considerably surpasses the lateral lobes of the sclerite; this prong rather narrow and because of its length appearing relatively long and narrow in comparison to that of *similaris*.

*Food plant:* Mesquite (*Prosopis* sp.).

*Distribution:* Common in southwestern United States (Arkansas, Colorado, Texas, New Mexico, Utah, Arizona, and California). Only 4 Mexican specimens known to the author, though this species must occur generally throughout the dry areas of northern Mexico. 1 ♀, Copete Mine, 30 miles east of Carbo, Sonora, Mexico (A.M.N.H.); 1 ♂, Monterrey, Nuevo León, Mexico, November 25, 1909. F. C. Bishopp (U.S.N.M.); and the 2 female types of *albina* from Chihuahua, Mexico (Field Museum).

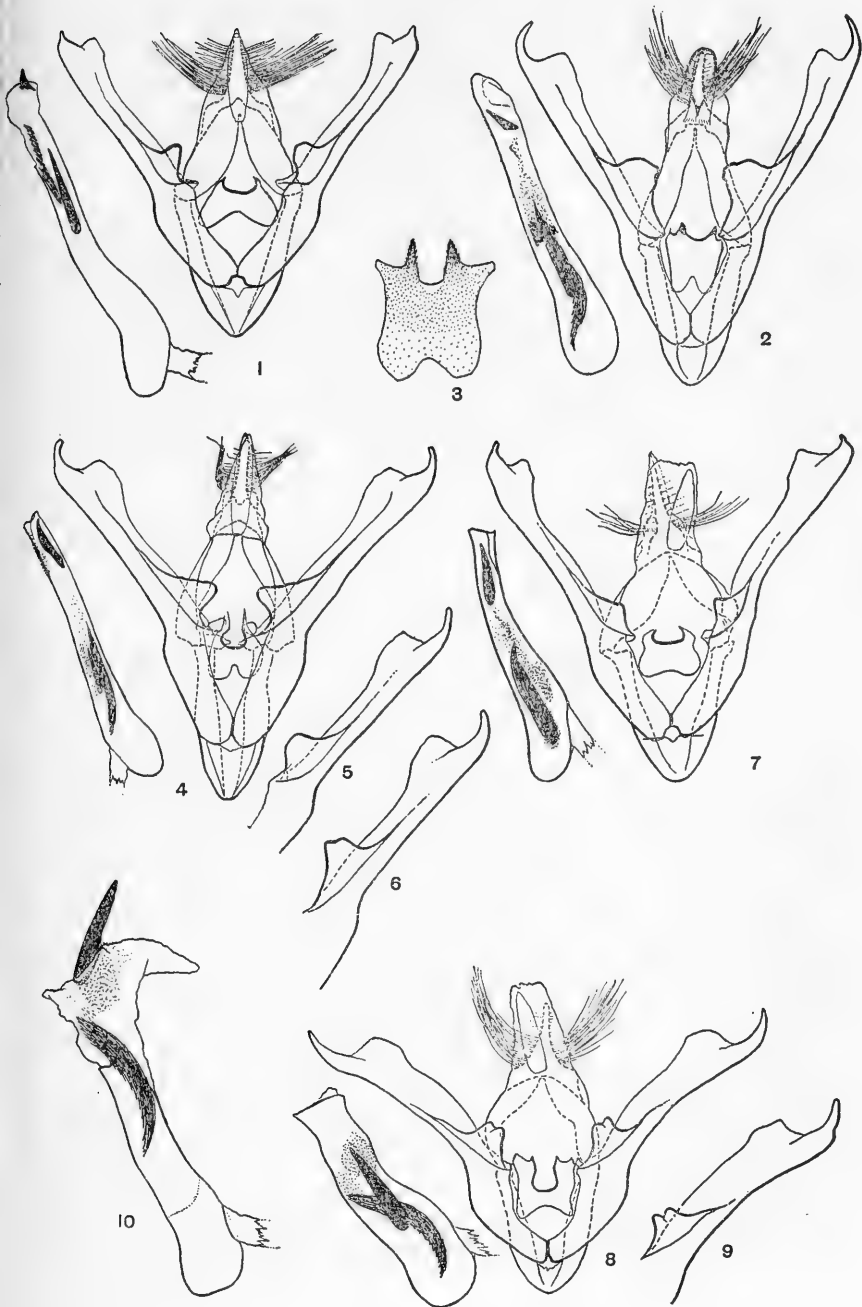
#### EXPLANATION OF PLATE 32

##### Male genitalia of the genus *Bulia* Walker

(All figures made with aid of camera lucida and at the same magnification except figure 3.)

- Figure 1. *Bulia confirmans* (Walker). Aedoeagus drawn alongside.
- Figure 2. *Bulia deducta* (Morrison). Aedoeagus drawn alongside.
- Figure 3. *Bulia deducta* (Morrison). Enlarged drawing of juxta (anellus).
- Figure 4. *Bulia similaris* Richards. Aedoeagus drawn alongside. Paratype.
- Figure 5. *Bulia similaris californica* Richards. Right valve only.
- Figure 6. *Bulia similaris californica* Richards. Right valve only.
- Figure 7. *Bulia mexicana* (Behr). Aedoeagus drawn alongside.
- Figure 8. *Bulia schausi*, new species. Aedoeagus drawn alongside. Holotype.
- Figure 9. *Bulia schausi*, new species. Right valve only. Paratype.
- Figure 10. *Bulia schausi*, new species. Aedoeagus with vesica distended. Paratype.



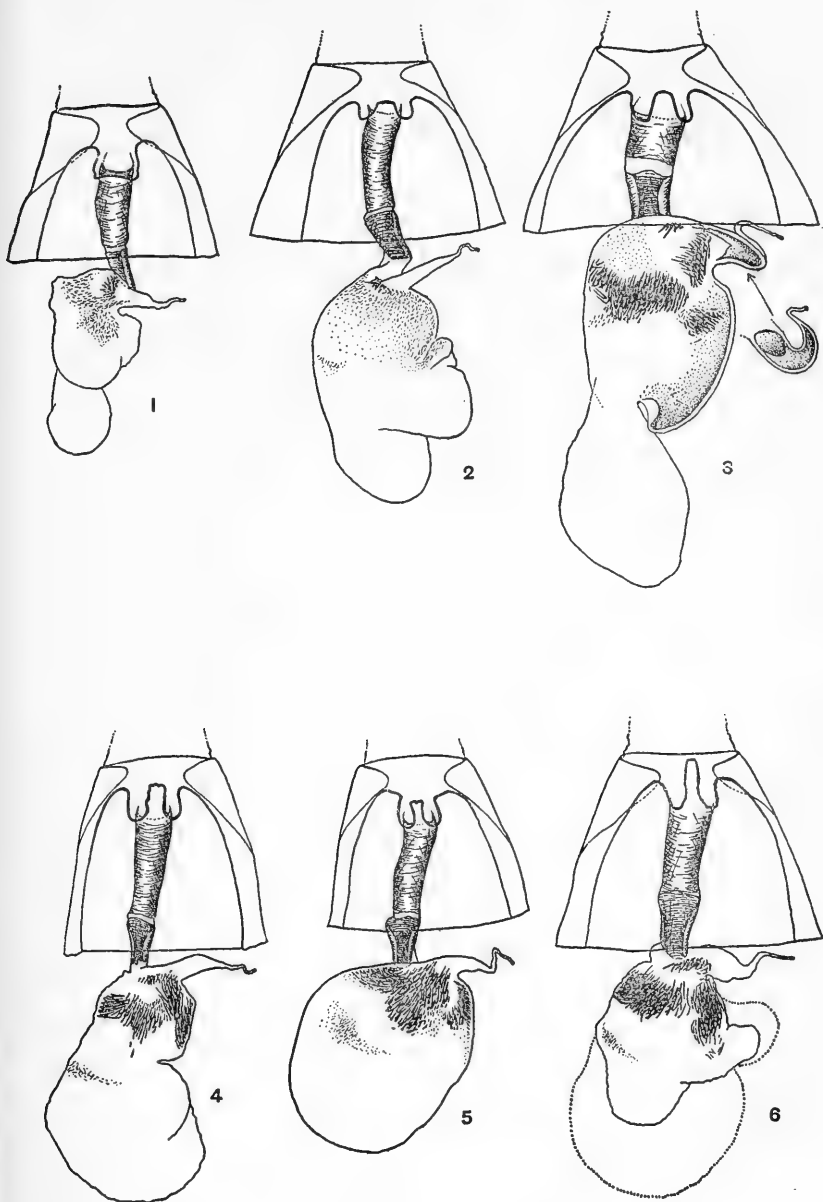


## EXPLANATION OF PLATE 33

Female genitalia of the genus *Bulia* Walker

(All figures camera lucida and same magnification, all ventral views.)

- Figure 1. *Bulia confirmans* (Walker). Mated specimen.
- Figure 2. *Bulia mexicana* (Behr). Mated specimen.
- Figure 3. *Bulia schausi*, new species. Mated specimen. Lateral view of opening of ductus seminalis drawn alongside. Paratype.
- Figure 4. *Bulia similis* Richards. Mated specimen.
- Figure 5. *Bulia morelosa*, new species. Mated specimen. Holotype.
- Figure 6. *Bulia deducta* (Morrison). Virgin; dotted line indicates silhouette of bursa copulatrix of a mated specimen superimposed on drawing of virgin.





REPORTS ON THE COLLECTIONS OBTAINED BY ALLAN HANCOCK PACIFIC EXPEDITIONS OF  
VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA,  
AND GALAPAGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935,  
IN 1936, IN 1937, IN 1938, IN 1939, AND IN 1940.

THE MALE GENITALIA OF EPIPOMPONIA  
MULTIPUNCTATA (DRUCE)

(Lepidoptera, Epipyropidae)

(PLATE 34)

*By* A. GLENN RICHARDS, JR.



THE MALE GENITALIA OF  
EPIPOMPONIA MULTIPUNCTATA (DRUCE)

(Lepidoptera, Epipyropidae)

(PLATE 34)

By A. GLENN RICHARDS, JR.

Zoological Laboratory  
University of Pennsylvania

Specimens of the various species of the family Epipyropidae of the superfamily Zygaenoidea are quite rare. Although about two dozen species have been described from the new world, practically all are known from unique specimens or very short series. The few known larvae are reported as being parasitic (predaceous ?) on Fulgorids (Order Homoptera), but an alternative view holds that they feed on the waxy secretions of these bugs. Because of the general scarcity of study material in this interesting family, description and figures of the male genitalia of *Epipomponia multipunctata* (Druce)<sup>1</sup> are presented for general availability—the other two specimens of this species known to the author are both females.

The single male available was collected at Port Utria, Choco, Colombia, February 14, 1934, by John S. Garth, and is in the collections of the Allan Hancock Foundation of The University of Southern California. The specimen was identified at the U. S. National Museum by Mr. Carl Heinrich, who suggested publication of this note.

In maculation the male is entirely similar to the female except slightly smaller in size (see colored figure in the original description).

*Male genitalia:* Uncus seemingly absent; if present, greatly reduced and indistinguishably fused with the gnathos. Tegumen slightly but definitely separated from gnathos on dorsum (fig. 4) and on sides to point of invagination of the apodemes, then the inner wall of apodemes and their ventral prongs fused with ventrolateral wall of gnathos (fig. 1); tegumen with lateral apodemes (figs. 2 and 4) which are heavily sclerotized especially along line leading posteroventrally to articulate with the anteriorly projecting costal bar of the valves (fig. 2). Gnathos complex and forming most of the dorsal portion of the genitalia; dorsally

<sup>1</sup> Original description: *Cossus* (?) *multipunctata* Druce, Biol. Centr. Amer., Lepid. Het., 1:230, pl. 24, fig. 9, 1886. (Unique female type.)

surrounding anus and extending ventrally as broad lateral shields (fig. 2) which have heavily setose ridges on both sides of the anal region (figs. 1, 4); ventral to the anus the gnathos forms large ridgelike lobes (socii ?) which are densely setose especially on their median sides (fig. 1), and from the undercut margins of these lobes a continuous sclerotization curves anteriorly and flattens out to form moderately sclerotized plates ventral to the anus (fig. 1). Vinculum shown adequately in drawings. Valves relatively simple and firmly fitted into the other parts; outer sides convex and terminating medianly in long, heavily sclerotized prongs (fig. 3); inner (median) and dorsal (costal) sides overhung and of considerable depth (fig. 3 shows the true depth which is from vinculum to the level of the median prongs); in addition, the costal margin has a more heavily sclerotized bar extending anteriorly into the body to articulate with the ventral prong of the apodeme of the tegumen (fig. 2), and also a narrower strip which passes medially at the lower (more anterior) level to form transtillae supporting the membrane dorsal to the aedoeagus (fig. 1). No anellus (juxta). Aedoeagus (penis) attached only at its base and sunk in a deep membranous pit in which it is freely movable (figs. 2, 3); strongly sclerotized, somewhat conical, opening broadly at its base for entrance of the seminal ducts (this opening shown by dotted lines in fig. 3, the lines dotted because all except the median dorsal prong of the opening is beneath the membrane forming the aedoeagal pouch); no vesica seen, the aedoeagus appearing as a hollow cone into which a pin may readily be pushed.

It seems needless to add that the depth of these structures results in extensive foreshortening, and that the various views drawn must be compared carefully. This is especially true of the relations of the costal bar of the valve to the ventral prong of the apodeme of the tegumen. In fig. 1 these are represented as heavy bars of stipple, but the degree to which they angle into the body (anteriorly) can be seen only by careful comparison of figs. 1 and 2.





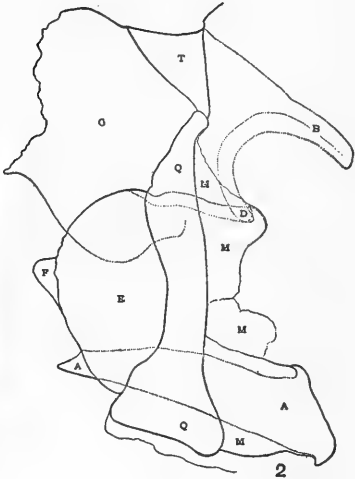
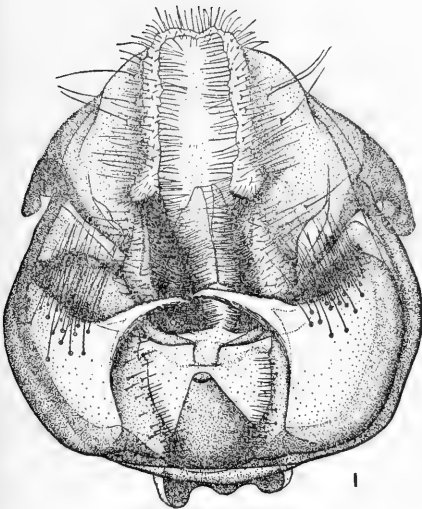
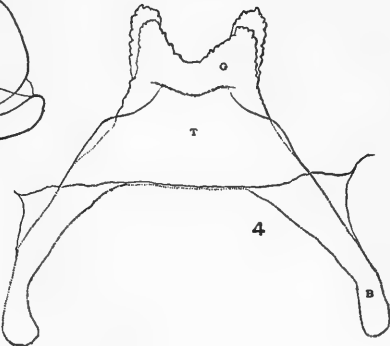
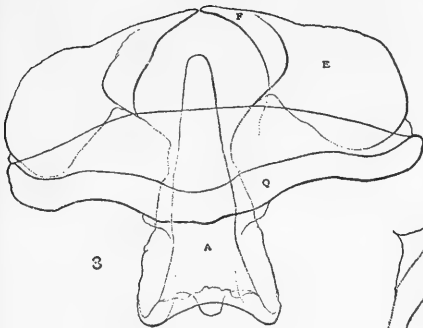
## EXPLANATION OF PLATE 34

*Epipomponia multipunctata* (Druce)

- Figure 1. Entire male genitalia. Ventral view, slightly from specimen's right.
- Figure 2. Outline drawing of lateral view of same. Underlying lines and invaginated apodeme of tegumen in stipple. Setae omitted.
- Figure 3. Outline drawing of ventral view of vinculum, valves, and aedoeagus. Underlying lines in stipple. Setae omitted.
- Figure 4. Outline drawing of dorsal view of tegumen and gnathos. Invaginated apodeme of tegumen in stipple. The rugosities of the anal ridges of the gnathos are setal bases, setae omitted.

## Abbreviations

- A = Aedoeagus  
B = Apodeme of tegumen  
D = Junction of ventral prong of apodeme of tegumen with costal bar of valve  
E = Valve (harpé)  
F = Long median prong of valve  
G = Gnathos  
M = Membrane  
Q = Vinculum  
T = Tegumen





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VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA,  
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IN 1936, IN 1937, IN 1938, IN 1939, AND IN 1940.

# PYCNOGONIDS FROM ALLAN HANCOCK EXPEDITIONS

(PLATES 35-48)

*By* WILLIAM A. HILTON



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# PYCNOGONIDS FROM ALLAN HANCOCK EXPEDITIONS

(Plates 35-48)

By WILLIAM A. HILTON

Department of Zoology, Pomona College

## FOREWORD

The pycnogonids of the Allan Hancock Expeditions reported on in this paper represent specimens collected over a period of several years. Through the kindness of the Allan Hancock Foundation of The University of Southern California I have been able to examine this valuable collection. Some of the specimens here reported upon were taken out of the Hancock Collections by Dr. Waldo Schmitt of the U.S. National Museum, and these also are included in this paper.

This paper is an account of specimens of pycnogonids received from the Allan Hancock Foundation. Most of the species mentioned were collected off shore, at moderate depth. In distribution they are especially from off southern California, the Gulf of California, and near the Galapagos Islands. They are as follows:

- Nymphon pixellae* Scott . . . . . p. 279  
Numerous examples especially off the California coast.
- Callipallene californiensis* (Hall) . . . . . p. 281  
Chiefly southern California coast.
- Anoplodactylus erectus* Cole . . . . . p. 283  
This is chiefly a shore form but was also collected off shore in deeper waters from Newport to San Diego.
- Anoplodactylus californicus* Hall . . . . . p. 286  
This seems to be a deeper water form for the most part. Found along the shores of southern California.
- Anoplodactylus robustus* Hilton . . . . . p. 288  
This seems to be found chiefly in deeper waters off shore in southern California.
- Tanystylum californicum* Hilton . . . . . p. 291  
Chiefly a shore form in southern California.
- Ammothea latifrons* Cole . . . . . p. 295  
This is a more northern form, being found in Alaskan waters, but one was sent to me from Station 1177-40, north of Santa Barbara Island, off the southern California coast, in 40 fms.

- Ammothella bi-unguiculata* (Dohrn) . . . . . p. 297  
 This is perhaps as widespread a species as any pycnogonid. I have found it from Lower California to southern California. It occurs also off Hawaii and Japan, to say nothing of its original description by Dohrn in the Mediterranean. It is chiefly a shore form.
- Ammothella heterosetosa*, new species . . . . . p. 299  
 This is from the Galapagos Islands. Specimens in U.S. National Museum.
- Nymphopsis spinosissima* (Hall) . . . . . p. 300  
 Chiefly along shore, southern California and Lower California.
- Nymphopsis duodorsospinosa*, new species . . . . . p. 303  
 Lower California.
- Eurycyde longisetosa*, new species . . . . . p. 305  
 Off Colombia, South America. U.S. National Museum specimens.
- Pycnogonum hancocki* Schmitt . . . . . p. 308  
 Shore, Galapagos Islands.
- Pycnogonum panamum*, new species . . . . . p. 310  
 Near Panama Canal, Pacific side. U.S. National Museum specimens.
- All measurements are in mm.

### Family **Nymphonidae** Hoek, 1881

Chelifori long, 2-jointed, chelate, with chelae usually held before the mouth. Palpi 5- to 7-jointed, longer than the rather short proboscis. Ovigera well developed in both sexes, 10-jointed, sometimes 8-jointed, with the end widened and with spines in most cases. Body usually elongate, segmented with suture lines showing. The 1st or ocular segment is usually broadened at its cephalic end. The neck extends in front of the 1st pair of legs.

#### Genus **NYMPHON** Fabricius, 1794

Body smooth, more or less slender, cylindrical, with well-defined lateral processes. Cephalic segment large, with marked neck and an expanded forward part. Caudal segment small, cylindrical. Eye tubercle more or less elevated, eyes usually equal, at the base of the proboscis. Proboscis rather thick, cylindrical, smooth, rounded at its end, not usually long. Chelifori well developed, hand narrow, fingers usually shorter than the palm and finely dentate on the inner margins. Palpi moderate length, 1st joint small. Terminal joints shorter than the 2nd or 3rd, often quite



hairy. Ovigera 10-jointed, few hairs. Fourth and 5th joints in the male very long and slender. The last 4 joints have a regular series of serrate spines. The terminal claw is well developed. Ambulatory legs as a rule very long and slender, few hairs. Second tibia the longest joint, tarsal joints more or less elongate. Terminal joint usually with distinct auxiliary claws. Egg masses in the male globular, small, usually one bunch to an oviger.

### **Nymphon pixellae** Scott

Plate 35

*Nymphon pixellae* Scott, Ann. Mag. Nat. Hist., Ser. 8, vol. 10, 1912, pp. 207-208, pl. 7.

*Nymphon solitarium* Exline, Proc. U.S. Nat. Mus., vol. 83, no. 2991, 1936.

*Nymphon pixellae* Hedgpeth, Ann. Midland Naturalist, vol. 22, no. 2, 1939, pp. 458-459.

*Distinctive features:* Body rather slender, elongate, lateral processes rather long. First joint of the chelifori quite a little longer than the proboscis. Jaw portion of the chelifori long, with the tips crossing. Many slender teeth on the jaws. Paired tarsal claws are about half as long as the unpaired. Eye tubercle sharply pointed. First joint of the tarsus longer than the 2nd.

#### *Description*

*Body:* Slender, elongate, segmentation marked, lateral processes well separated. Trunk segments nearly equal in thickness except the posterior, which is a little more slender. Segments of the body about the same length, a little thicker where the lateral processes join. The anterior segment forms a well-marked neck.

*Ocular region:* The eye tubercle is just forward of the origin of the 1st pair of walking legs, between the bases of the ovigera. The eye elevation is well marked and abruptly pointed at its end. The eyes are at the basal end of the ocular elevation. They are large and almost touch. They are also quite well pigmented.

*Abdominal segment:* Cylindrical, pointed up, rather small.

*Chelifori:* First joint rather slender, quite long. The 2nd segment is shorter and a little heavier. The fingers are long, slender, with many teeth. The fixed finger is nearly straight to near its tip, which is strongly curved.

*Palpi:* Slender, the 1st joint is very small, the 2nd is longer, the last 3 joints are shorter than the 2nd and about of equal length.

*Oviger*: Ten-jointed, the 1st short, 2nd and 3rd about equal and a little longer than the 1st. The 4th is about twice as long as the first 3. The 5th is more slender and longer than the 4th and is swollen at the distal end. The 6th is shorter, with many small hairs on its ventral side. The 7th is shorter than the 6th, with an even row of about 13 elongate spines on its ventral side. Each spine has lateral extensions. The 8th joint is shorter than the 7th. The 9th and 10th are about equal to the 7th in length and are similarly armed with spines. The 10th segment bears a long terminal claw with teeth on its lower margin.

*Ambulatory legs*: Not very hairy, about 37 mm. long; the 1st coxa is the shortest of the three, and the 2nd is the longest. The femur is quite long and is curved ventrally. The 1st tibia is a little longer and the 2nd tibia is the longest leg joint. The 1st tarsus is longer than the 2nd. The terminal leg claw is well developed, and the paired claws are about  $\frac{1}{2}$  as long.

*Measurements*: The proboscis is about 2 mm., with the neck region about 1.7 mm. The 1st body segment is slightly longer than the 2nd. The lateral processes are a little longer than the abdominal appendage.

*Comparisons*: This species resembles *N. meridionale* and *N. hiemale*, but the 1st segment of the cheliforus is shorter than the proboscis.

#### *Material studied*

One specimen, Station 575-36, north of San Pedro Nolasco Island, Gulf of California, March 12, 1936, 100 fms.

One young specimen, Station 719-37, Lower California, Consag Rock, March 24, 1937, 10-25 fms.

One male, No. 3856, Redondo Beach, California. Collected by Burch.

One female, Station 1185-40, southern California coast, September 28, 1940, 50 fms.

Two females, 1 male with eggs, Station 909-39, Catalina Island, Emerald Bay, 2 miles off shore, Jan. 28, 1939, 65-90 fms.

One female and 1 young, Station 1181-40, southern California coast, Sept. 10, 1940, 47 fms.

One female, Station 978-39, Santa Barbara Island, east of Gull Island, May 28, 1939, 21-28 fms.

In addition, I have abundant material from about 2 dozen localities off the west coast of North America. These and other records at my disposal give this range from the Canadian border down to Lower California. This species is a very common one in waters of moderate depth. Most of the records are of specimens not many miles off shore.

Family **Callipallenidae** (Hoek), 1876

Chelifori well developed, palpi lacking in most, ovigera in both sexes. The chelifori are 2- or 3-jointed with very large chelae, which extend over the mouth. In a few there are palpi 1- to 4-jointed. The ovigers are 10-jointed and are well developed in both sexes. They are usually coiled at the free ends and are supplied with marked compound spines. The body is elongate and segmented. The eye segment is on the neck in front of the base of the 1st pair of walking legs. The proboscis is rather short and cylindrical. There are 4 pairs of walking legs. The sex openings in the male are in the 3rd and 4th pairs or in all the legs. In the female the sex openings are in all the legs.

**Callipallene californiensis** (Hall), 1913

Plate 36

*Pallene californiensis* Hall, Univ. Calif. Pub. Zool., vol. 11, no. 6, 1913, pp. 131-134, pl. 4.—Hilton, Jour. Ent. and Zool., vol. 8, no. 3, 1915, p. 67; 1920; vol. 31, no. 2, 1939, p. 92.

*Characteristics:* Slender body, ocular segment rather compact, short neck. First segment of the body not quite so long as the rest of the body and the 1st coxal segment of the last pair of legs. Three strong spines on the 2nd tarsal joint below. The 1st and last of these may be paired. Fifth joint of the oviger with a marked projection. Third and 4th body segmentation lines not distinct.

*Description*

*Body:* Short, stout, smooth surface. Anterior corners of 1st body segment rounded with quite a constriction of this part laterally, halfway between the posterior border of the segment and the base of the chelifori. Lateral processes with bases contiguous. A furrow in the body makes it appear that there are precoxal joints to the legs. Segmentation distinct between 1st and 2nd and 2nd and 3rd body segments. Third and 4th body segments united, but with a line or furrow in the integument across the body anterior to the insertion of the caudal segment and shows trace of obsolete segmentation between these segments.

*Ocular tubercle:* Low, situated above and between the lateral processes of 1st legs, and distinct, about its own diameter from the posterior body segment.

*Proboscis:* Very short and blunt, length  $\frac{3}{4}$  its diameter. Anterior corners rounded.

*Palpi:* Wanting.

*Oviger:* Ten-jointed, 4 terminal joints spirally rolled with a row of flat denticulate spines on the inside of the last joints. No terminal claw. First 3 joints short, 4th about as long as the first 3 together. Fifth longest, with a projection on the distal end directed opposite to spiral terminal joints. Two simple curved hairs, one at the tip of the elevation, the other distally placed. Terminal 5 joints short, nearly equal in length, becoming a little thinner toward the end. Eggs 0.2 mm. in diameter.

*Ambulatory legs:* Slender, no evident knobs or spines. First coxa about as long as its diameter. Second coxa about 3 times the length of 1st coxa. Femur about equal in length to combined lengths of the coxal segments or joints. First tibial joint not quite so long as the femur, 2nd tibial joint about as long as the femur but of less diameter. Scattered hairs on the tibial joints. Tarsus a little less than half as long as the length of 2nd tibial joint. Terminal claws a little over half the length of the tarsus. Auxiliary claws  $\frac{2}{3}$  as long as the terminal claws. Several simple hairs on the distal end of the tarsus. Spines on the male very stout, especially near the head. A light fringe of hairs is usually present at the distal end of each joint in all the legs.

*Measurements* of the type by Hall: Length, 1.25; proboscis, 0.27; body, 0.93; caudal segment, 0.15; 3rd leg, 4.05.

General form of the body somewhat like *P. laevis* Hoek, but the proboscis is not jointed, and the oviger does not end in a claw in this species. The proboscis is more like that of *P. empusa* Wilson, but the general shape of the 1st body segment is different, being stouter than in this last species.

*Material:* I have found this species under stones at low tide at Laguna Beach usually associated with delicate bryozoans and hydroids. A few specimens found almost every year for the last 25 years.

One female from under a stone between tide marks.

One female, Station 1184-40, Indian Rock, Catalina Island, Sept. 11, 1940, 62 fms.

*Color:* Light, almost colorless. Body and legs smooth.

### Family **Phoxichilidiidae** Sars, 1891

Chelifori long, 2-jointed, provided with jaws which lie over the mouth. The palpi are lacking. The ovigers are developed only in the male or are vestigial in the female, without a coil at the end and without

strong spines. The body is elongate and segmented. The eye segment is formed on the base of the proboscis in a little elevation. There are 4 pairs of ambulatory legs. The sex openings in the male and female are in all 4 leg pairs except in *Halosoma*, where they are in the last 2 pairs.

**ANOPLODACTYLUS** Wilson, 1878  
(**PHOXICHILIDIUM** in part)

Trunk rather slender, with the 1st segment constricted anteriorly and extending forward some distance beyond the base of the proboscis, forming a narrow neck. Lateral processes comparatively long and well separated. Proboscis projecting obliquely downward from the ventral side of the 1st trunk segment. Eye tubercle at the extreme forward end of the segment. Chelifori rather small, chelate. Ovigera slender, 6-jointed, terminal joints small. Egg masses several, globular, 1 or 2, loose, and more or less irregular in shape. Legs slender, long. First tarsal joint very short. Ventral margin of the 2nd tarsal joint projection at the base or heel armed with strong spines. Auxiliary claws minute. Its long projecting neck, weaker chelifori, and 6-jointed ovigera with very small terminal parts help to distinguish this genus from *Phoxichilidium*.

**Anoplodactylus erectus** Cole, 1904

Plate 37

*Anoplodactylus erectus* Cole, Harriman Alaska Exp., N.Y., 1904, 8°, vol. 10.—Hilton, Jour. Ent. and Zool., vol. 8, no. 3, 1915; vol. 8, 1916; vol. 12, no. 4, 1920, p. 72; vol. 31, no. 2, 1939, p. 92; vol. 31, no. 4, 1939, p. 29.

*Characteristics:* Body and legs slender. Lateral processes well separated. Eye tubercle conical, eyes near its top. Abdominal segment cylindrical, pointed sharply upward. Second tarsus slender, about equal to 2nd coxal joint. Not strongly curved, 2 larger and sometimes 1 smaller sharp spine at the base of the 2nd tarsus below. Terminal claw long, slender; lateral claws small, slender. Toward the base of the 2nd tarsus below is a knifelike edge.

*Description*

*Body:* Lateral processes long, well separated, larger distally, where each has a small conical projection on the dorsal side pointed somewhat outward. First trunk segment larger than the following two together, constricted in its anterior half and produced into a narrow neck.

*Eye tubercle:* At the extreme forward end of the 1st trunk segment and projecting upward and a little forward, about as long as the 2nd trunk segment and cylindrical. From the side it is seen to be blunt ended. Eyes nearer the top than the base.

*Proboscis:* About as long as the 1st trunk segment. Cylindrical.

*Caudal segment:* Moderately long, projecting upward at a sharp angle. More or less cylindrical, tapering to a point, often bulging in the center, notched at the tip. May have 1 to 3 hairs on its sides.

*Chelifori:* These extend forward from the extreme front end of the 1st trunk segment. About equal to the 1st segment of the body in length. First joint slender, almost cylindrical, just slightly enlarged at the distal end. Smooth but for a few hairs. Chela long just over the front and bent nearly at right angles with the 1st joint and not half so long, with a few hairs. Fingers slender, curved, sharply pointed, about as long as the palm. Movable finger longer than the other and more strongly curved.

*Oviger:* As long as the animal or longer, slender. First joint short, comparatively thick, 2nd joint twice as long, more slender; these 2 joints extend downward. The 3rd joint bends backward to run nearly parallel with the trunk. It is half again as long as the first 2 joints together and is more slender than the 1st; slightly curved, with the convexity upward. About  $\frac{1}{4}$  its length from the basal end is a constriction which looks a little like an articulation. Fourth joint is somewhat shorter than the 2nd, slightly curved. Fifth joint shorter, bent back sharply on the 4th; 6th joint very small oval. The 5th and 6th together scarcely equal the 4th. The 3rd, 5th, and 6th have a few short stiff hairs; some on 6th are directed backward. Eggs in several globular masses.

*Ambulatory legs:* Slender, 2nd pair  $2\frac{1}{2}$  times the total length of the animal. First coxa short, a little longer than broad. Second coxa over twice the size of 1st; at about the center of its dorsal side is a small rounded elevation. In the male the ventral side extends at the distal end into quite a projection with several small bristles, and at the end of this is the genital opening. The female does not have the projection; its distal end is swollen, and the genital opening is situated on a slight elevation a little back from the tip. Third coxal joint longer than the 1st, and it becomes larger as it joins the next division. Femur nearly as long as the whole coxal region, often larger in the female. It is produced dorsally at the distal end into a rounded projection with a long slender hair. In the male there is also a process on the femur just beyond the middle on the

dorsal side, and it is continued out into a narrow tube which projects distally as the end of the opening of the agglutinative gland whose secretion is supposed to fasten the eggs together. The 2nd tibia is slightly longer than the 1st, and both are shorter than the femur. At the distal end of the tibia there is a projection similar to the one on the femur but smaller, but also with a hair. About  $\frac{1}{4}$  of the distance from the distal end of the 2nd tibia on the dorsal side is a slight elevation which has a long hair projecting from it. The 1st tarsal joint is very small, roughly triangular, with a broad ventral base with a few moderately strong hairs and a dorsal knob. Tarsus 2 is rather slender, about equal to coxa 2. It is not strongly curved but appears arched on the ventral side because it is much expanded at the base, where it has 2 stout, distally curved spines and a few smaller hairs. The proximal half of the remainder of the ventral margin or the sole is armed with 2 stout, distally curved spines and some smaller hairs. The proximal half of the rest of the ventral margin is armed with a series of close-set distal curved spines varying from 7 to 11. Along the distal part is a thin lamellar knifelike chitinous plate along the sides of which are a very few bristles.

The claw is long, curved, reaching as far back as the heel. Its inner edge is thin, knifelike. Auxiliary claws are very small but distinct with the sole with about 6 spines and a row of 6 or more before the knifelike plate. The legs have few hairs.

*Color:* Pale, little color in legs or body.

Cole's specimens were as follows: 6 males, 1 female, collected by Professor Kelsey, Sept., 1896, San Diego, California; 1 female, July 8, 1895, collected at San Diego by Dr. S. J. Holmes.

This species is similar to *A. petiolatus* Kröger. In *petiolatus* the trunk is stouter, lateral processes are not so much separated, the caudal segment is long and cylindrical, abruptly acuminate, and placed horizontally. The proboscis is of simple cylindric form. The immovable finger of the chela is nearly straight. The ovigera are as long as the animal. The legs are shorter, being not more than twice the length of the animal. The 2nd tarsal joint is more strongly curved with 4 to 6 spines on the proximal part of the sole. First, there are 2 large medial spines; then, 2 pairs of smaller ones.

This species I have found in great abundance associated with *Tubularia croecia* and *Coryomorpha*. In the former case the complete life history was found associated with these hydroids. Very early stages, shortly after leaving the male, migrate to the coelenteric cavity; later, after sev-

eral stages, they make their way to the outside, where they may be found with those with 3 pairs of ambulatory legs, up to the adults that were sexually mature. At various times immature forms and adults were found on *Coryomorpha*, but I have not as yet direct evidence of their living on these palm hydroids in the youngest stages as they were in *Tubularia*.

This species has been found during a number of years at Balboa, California. Hundreds of specimens have been obtained from Newport to San Diego, California.

The total body length of an average specimen was 2.5; total leg length, 7; spread, 15.

One young specimen, Station 532-36, San Francisquito Bay, Lower California, March 2, 1936, 20 fms.

Also 1 specimen, Station 1162-40, off Seal Beach, July 23, 1940, 95 fms.

One specimen, Station 978-39, Santa Barbara Island, east of Gull Island, May 28, 1939, 21-28 fms.

### **Anoplodactylus californicus Hall, 1912**

Plate 38

*Anoplodactylus californicus* Hall, First Ann. Rep. Laguna Beach, 1912; Marine Lab. 8, 1912, pp. 91-92; Univ. Calif. Pub. Zool. 8, vol. 11, no. 6, 1913, p. 192, pl. 4.—Hilton, Jour. Ent. and Zool., vol. 8, no. 3, 1915, p. 67; vol. 12, no. 4, 1920, p. 92; vol. 31, no. 2, 1939, p. 29.

*Diagnosis:* Body and legs rather heavy skin, pitted. Transverse processes separate, but not widely separated, almost touching. Second coxal joint larger at its distal end, with a marked projection on one side. Second tarsal joint heavy, arched, bearing 2 prominent teeth at its base.

#### *Description*

*Body:* Rather short; lateral processes about as long as their own diameter, with bases contiguous. First 2 intersegmental lines hardly evident. The 2 forward processes point forward slightly. The 2 caudal processes point more decidedly backward.

*Eye tubercles:* A large conical projection arises from the anterior edge of the body and projects over the proboscis. The eyes are not very evident. Deeply pitted skin.

*Proboscis:* Cylindrical, with end rounded. Almost as long as the body. Diameter  $\frac{1}{2}$  its length.



*Abdominal segment:* About the same size as the eye tubercle but more regular. Deeply and closely pitted.

*Chelifori:* Large, quite well-developed chelae. The whole appendage extends about  $\frac{1}{2}$  their length beyond the proboscis. A few short spines arise on the chelae. Legs rather long, stout, with very few hairs. First coxa shorter than its diameter, 2nd over twice the length of the 1st and enlarged at its distal end. Third coxa  $1\frac{1}{2}$  times the length of the 1st. Femur longer than the coxae together. Tibial joints about  $\frac{3}{4}$  the length of the femur. Tarsus about  $\frac{1}{2}$  the length of the tibial joints. Claw  $\frac{2}{3}$  the length of the tarsus, auxiliary claws very small.

*Measurements* of the type were: Proboscis, 1.42; body from proboscis to abdomen, 1.5; leg, 8; lateral processes of the body, 0.428 diameter.

Hall's specimen was taken from *Fucus* at low tide. It was observed feeding on a nudibranch.

This species resembles *A. erectus* Cole. In 1913 Hall gave notes on this species. In 1912 a number were collected at the bases of *Phyllospadix* at low tide, several specimens of both sexes being obtained. The male was found to be  $\frac{1}{5}$  smaller than the female, with 6-jointed ovigers, the last 3 segments of which were spirally coiled and closely set with spines, mostly directed proximally. There were several groups of eggs. Chelae of both sexes were often bent in front of the proboscis. The eye tubercle and abdomen project from the body at about the same angle, but not quite perpendicularly. The protuberance on the distoinferior aspect of the 2nd coxal joint is about twice as long in the male as in the female. Openings of the cement gland of the male were on the superior aspect of the femur about halfway down on legs 2, 3, and 4.

*Measurements:* Length, female type, 3; male, 3.6; maximum, 3.8. Proboscis, female type, 1.5; male, 1.5; maximum, 1.6. Body, female type, 1.5; male, 1.8; maximum, 2.1. Span of 2nd process, female type, 1.5; male, 1.8; maximum, 2.1. Caudal segment, female type, 0.6; male, 0.53; maximum, 0.65. Third leg, female type, 8.5; male, 9; maximum, 10.2.

*Color:* Dark straw.

This species is very close to *A. erectus* Cole. The chief differences are as follows: The lateral processes are not so widely separated and in some specimens may even touch at their bases. This, however, I consider of minor importance because the condition of the body, perhaps individual variation, makes a difference here. The tarsus is different in the two, being more robust in both claw and 2nd tarsal joint in this species than in *A. erectus*.

Several specimens from Laguna Beach agree in most respects with Hall's descriptions. However, I am inclined to the opinion that this and the next described species *may* be the same. The chief difference between them seems to be the position of the lateral processes, which are closer together in this species.

One specimen, Station 1184-40, Indian Rock off Catalina Island, Sept. 11, 1940, 46 fms.

### **Anoplodactylus robustus** Hilton, 1939

Plate 39

*Anoplodactylus robustus* Hilton, Jour. Ent. and Zool., vol. 21, 1939, p. 28.

*Characteristics:* Body heavy. Legs rather long, heavy. Second tarsus with 3 long spines in its basal region and many smaller ones farther along. Median tarsal claw long, moderately slender, with a narrow free edge below. Paired tarsal claws slender, small. Body heavily chitinated, moderately pitted. Attachment discs on the under sides of the base of the proboscis.

#### *Description*

*Color:* Dark brown, red brown, or often greenish; after preservation the color may be pink or red.

*Body:* Rather robust, elongate. Segments marked by prominent suture lines. Lateral processes about as broad as the ventral part of the body, each with a slight knob on its distal dorsal border. The 1st process is directed forward; the 2nd, straight out; the 3rd and 4th directed backward. The last 2 are contiguous at their base. The 1st or ocular segment roughly pointed in front, with the neck bearing the eye tubercle continued forward over the base of the proboscis. Just above, where the ovigers come off, are 2 little processes slightly in front of the 1st lateral process. There are 3 suture lines across the body: the 1st just back of the 1st pair of lateral processes, the 2nd just back of the 2nd pair of lateral processes, and the 3rd back of the 3rd pair of legs.

*Ocular elevation:* Quite high and situated on the short neck, from which the chelifori take origin. It is pointed straight up and runs to a sharp tip. At its base are 4 well-developed eyes, quite deeply pigmented.

*Proboscis:* Irregularly cylindrical, swollen slightly at the center and at the ends. Shorter than the body.

*Abdominal segment:* This is rather slender and quite long. It points straight up and is slightly smaller at its tip.

*Chelifori*: Strongly developed and close together as they come off from the narrowed end of the 1st body segment. The 1st joint is cylindrical and about half as thick as a leg. It is somewhat bent toward the end and projects beyond the end of the proboscis. The 2nd just meets the 1st at an angle. The chelae are rather showy, the fingers shorter than the palm. The movable finger is on the outside. There are a number of short hairs on the chelae.

*Ovigers*: Well developed in the male (Type). Often indicated in the female by a short single joint. Six-jointed, the 1st joint rather long, thick; 2nd longer, but less thick; 3rd like the 2nd, but longer; 4th shorter, about  $\frac{1}{2}$  as long as the last, bent at the ends into a slight bow; 5th about the size of the last, bent and nearly parallel with the last; 6th small, a mere knob. The last 3 joints have delicate hairs, especially on their inner sides.

*Ambulatory legs*: Long, rather heavy, 1st joint a little longer than broad and broader than the next joint, especially its base. Provided with 2 slender lateral distal spines. Second coxal joint about twice as long as the last but more slender. It bears a few lateral hairs, and on all legs it bears a prominent distoventral projection. This is especially large on the first 2 pairs of legs but is evident on the others. These spurlike extensions have short hairs on them. The 3rd coxal joint is a little longer than the 1st but more slender. It bears a few sharp hairs on its distoventral border. The femur is about the diameter of the 3rd coxal joint at its base but becomes larger farther on. It is longer than the whole coxal region. It bears a few hairs and a sharp knob on the dorsal distal surface. The 1st tibial joint is nearly as long as the femur, narrow at its base, but extending distally with a few hairs on the shaft and a group around the distal end. Second tibia is longer than the last but more slender. It has a few prominent hairs on the shaft above and a few at the distal margin. The 1st tarsus is comparatively large, almost cylindrical, with very little of its edge free above, but a long line below ending in a forward extension armed with a group of rather long, strong hairs directed forward. It has fewer hairs on its more ventral portion, but the forward end is especially well provided with hairs. This part articulates with the 2nd tarsus at an angle, with a marked projection of the basal part of the 2nd tarsus, into a prominent lobe. This lobe is armed with 2 heavy spines at its base and a double row forward of 4 or 5 more in each row nearly as large as the basal hairs. The more forward part of the joint has 2 rows of much smaller hairs on its rather straight ventral edge. The terminal claw is

long, rather slender, with a thin inner edge. It is a little ventral to the end of the joint and is about half the length of the joint. There are a few small hairs about its base above. There is a very small auxiliary claw on each side of the large terminal one.

The description given above is that of a male specimen. The female is similar, but there are a few points of difference. They do not differ much in size, but the projection on the 2nd tarsal joint is less prominent in the female. The female also is nearly lacking in ovigers, but they are represented by a small unjointed knob at the base of the proboscis below. Also on the base of the proboscis of the female are 2 swollen elongate areas provided with chitinous thickenings. These are elongate and close together. They seem to be some sort of attachment organ, and are not present in the male.

*Color:* Dark brown, red brown, or often greenish; after preservation the color may be pink or red.

*Measurements* of the male type: Length of body, 3; proboscis, 2.5; lateral processes, 1; total breadth of body, 2.75. First joint of chelifori, 1.1; 2nd joint, 0.4. Oviger, 1st joint, 0.07 by 0.03; 2nd joint, 0.075 by 0.02; 3rd joint, 1 by 0.02; 4th joint, 0.05 by 0.01; 5th joint, 0.03 by 0.01; 6th joint, 0.01 by 0.01. Spread, 24.5. Abdomen, 0.75 by 0.04. Eye tubercle, 0.5 by 0.6 at the base. Length of leg joints, 1st, 0.45; 2nd, 1.2; (projection in female, on the last legs, 0.5;) 3rd, 0.95; 4th, 2.2; 5th, 2; 6th, 2.2; 7th, 0.25; 8th, 1; large claw, 0.85. The small one is very small, not more than 0.01 long.

This species differs from *A. californicus* in being heavier, with its lateral processes more widely separated. It has much more marked extensions on the 2nd coxal joints, and the 1st coxal joint is different in shape. It has attachment discs and vestigial ovigers in the female. It differs from *A. erectus* in being heavier bodied. Its 2nd tarsals are heavier in this species. The color of the body also differs. In *A. erectus* it is pale, often light, almost colorless. In *A. californicus* the color is a deep brown, often red brown to greenish. In preservative it may retain a red-brown or sometimes a greenish color for some time. This species is also heavier than *A. erectus*. I have found it in a number of places along the southern California coast, including the Isthmus at Catalina Island, where it was associated with *L. marginatus* in Fucus. It is also occasionally hid in the roots of eel grass and in the holdfasts of kelp from deep water. Some specimens were well pitted, dark in color, and some from deep water were overgrown with bryozoans or hydroids. Well-developed eyes were found

in some deep-sea specimens, and the females or young sometimes had stubs of chelifori and attachment discs on the lower side of the base of the proboscis.

*Material:* Three specimens of this species, 1 male, 2 females, are from Station 719-37, Consag Rock, Lower California, Mexico, March 24, 1937, on or associated with a basket-star, at a depth of 10 to 25 fms. One specimen, Laguna Beach, 1939.

### Family **Tanystylidae** Schimkewitsch, 1913

Chelifori, rudimentary or lacking. Palpi sometimes longer, sometimes shorter than the proboscis, 4 to 7 joints. Ovigera developed in both sexes. Sometimes curved at the ends, the terminal joints with or without spines irregularly arranged. The body is concentrated and the segments fused with each other. Four pairs of ambulatory legs. Sex openings in various genera in various positions: in the male, in the 2nd, 3rd, and 4th leg pairs in *Tanystylum* and *Austroraptus*; in the 3rd and 4th leg pairs in *Discoarachne* and *Trigaelus*; and in the 4th pair in *Rhynchothorax*. In the female the openings are in all leg pairs except in *Tanystylum*, in which they are in the 3rd and 4th pairs, and in *Rhynchothorax*, in which they are in the 4th pair.

### Genus **TANYSTYLUM** Miers, 1879

Trunk broad, with short lateral processes not widely separated from each other. Body not segmented, disc shaped. Chelifori lacking or represented by a small 1- to 2-jointed appendage, which may bear jaws in immature specimens. Palpi 6- to 7-jointed. First and 3rd joints short, 2nd and 4th longer. Femoral joints of female often enlarged.

### ***Tanystylum californicum*** Hilton, 1939

Plate 40

*Tanystylum californicum* Hilton, Jour. Ent. and Zool., vol. 31, 1939, p. 32.

*Diagnosis:* Body as a whole circular in outline. Skin pitted, dark, strongly chitinized. Lateral processes separated by narrow intervals. Lateral processes with 2 moundlike elevations on their free margins on the dorsal side. Second tarsal joint with 3 strong teeth on the rather definite heel. Lateral claws less than  $\frac{1}{3}$  the length of the long claws.

*Description*

*Color:* Light straw with a deeper color where the chitin is thicker, especially between the lateral processes of the body. Skin pitted.

*Body:* Broad, no segmentation. The lateral processes separated from each other by narrow intervals which penetrate well toward the center of the central disc of the body. The lateral processes are provided with 2 moundlike elevations at their free margins on the dorsal side. The body as a whole is of a nearly circular outline, truncate in front. The ocular region of the 1st body segment presents a straight line at its cephalic margin, and the elevation including the ocular eminence is in the form of a rounded triangle. This triangle is slightly higher than the surrounding body parts. The ocular elevation is in the center of the broadest side of the triangle, which is the front margin. The lateral margins of this whole elevation are bent in on each side, giving the triangular elevation a 3-pointed area whose front margin is straight and whose lateral margins are curved in.

*Eye tubercle:* This is a sharply pointed elevation in the center of the front margin of the triangular elevation mentioned above. The 4 eyes are along the sides of this projection and are but slightly pigmented, although well formed and about of equal size.

*Proboscis:* Broad at the base and then tapers quickly to less than half the breadth of the base and ends in a rather small tip. It is shorter than the palpi. There is a slight suggestion of constriction about  $\frac{2}{3}$  of its distance from the base. The tip of proboscis including its last  $\frac{1}{3}$  bends sharply downward.

*Caudal segment:* Cylindrical, about as long as the lateral processes and bears several short hairs.

*Chelifori:* Single-jointed, slightly longer than the 1st palpal joint, and a little less than half as wide as the 1st palpal joint. They are just within the palpi in position, and each is provided with 3 or 4 short stout spines near its tip.

*Palpi:* These seem to be 5-jointed. The 1st joint is short, the 2nd about twice as long. The 3rd is the longest joint and gives some indication of fusion of 2 parts. The 4th joint is short, with a blunt free projection at its inner end distally. The last, or 5th, joint is longer than the 4th but more slender. There are very few hairs on the 1st joint. The 2nd has a lateral hair which is quite prominent. The 3rd joint near its base has several prominent hairs, especially a rather long slender median one. Toward the tip of this joint are a few more moderately prominent hairs.

The next to the last, or 4th, joint bears several strong hairs on its free blunt appendage. The last joint has a fringe of short stout hairs on its inner margins and slightly stronger ones, about 4 in number, at its distal margin. There is a decided bend in the palpi at the 4th joint. The palpi as a whole slope downward, but the bend at the 4th joint prevents them from extending below the tip of the proboscis.

*Ovigers:* These are apparently 10-jointed in the male type. The last 4 joints are small, and the last 3 are bent back upon the others. The last joint is small, armed with 3 long spines. The next 2 are not clearly marked; each has 2 short spines. The 4th from the last bears a thick projection almost at right angles to the rest of the segment. This appendage or joint bears several strong hairs. The next joint above is about equal to this in size but bears fewer hairs. Of the other joints, the 1st is short and broad, the 2nd is about the same length but not so broad by half, the 3rd and 4th are about equal, the 5th a little longer than the 4th and bent almost at right angles to it. There are many specimens which have no ovigers, yet seem to be adult. Some, at least, seem to be adult females.

*Color:* Light straw, with deeper red-brown where the chitin is thicker.

*Ambulatory legs:* The legs seem about equal in length. The 1st coxal joint bears 3 distal projections on its dorsal side. The cephalic joint is the largest and bears about 4 short, sharp hairs. The middle one, which is not quite in the center, is next in size, is conical, and bears a hair at its tip. The most rounded is the smallest, and it bears 2 short hairs. The 2nd joint is about as long as the last but bears no fleshy appendages. There are, however, a number of short, straight hairs along its distal and caudal margin. The 3rd joint is a little narrower and a little longer than the last, with a few lateral hairs in the central part of the caudal margin. The 4th joint is about twice the length of the last, with 2 small groups of small hairs on its cephalic margin and other groups dorsally and caudally disposed. The 5th joint is about like the last, with about 3 rows of hairs on the dorsal surface. The 6th joint is similar with scattered short spines above. The 7th joint or heel is short, with many slender hairs on its lower surface and one large tooth. The last joint is gently curved, bearing a large terminal claw and 2 smaller claws which are less than a third the length of the large claw. The upper side is quite convex and rather free from hairs; the lower side has 3 strong teeth near the heel and a number of more delicate hairs along the whole concave margin. The terminal claw is less than half the length of the terminal joint.

*Measurements:* Length of body, 0.85 by 0.8 across. The lateral processes each are 0.25 deep; the body between is 0.3 across. The proboscis is 0.55 long by 0.3 at the base, and 0.005 at its tip. The ocular tubercle is 0.15 at its base and 0.2 high. The abdomen is 0.3 long by 0.175 broad. The chelifori are 0.05 long. The palpi have the joints as follows: 1st, 0.075 by 0.1 wide; 2nd, 0.2 long; 3rd, 0.375 long; 4th, 0.2 long; 5th, 0.2.

Type U.S. National Museum, No. 110391.

Specimens collected from Monterey to southern California. Two specimens, Station 1184-40, Indian Rock, Catalina Island, Sept. 11, 1940, in sea weed, 1 fm.

### Family *Ammotheidae* Dohrn, 1881

First appendage well developed, longer or shorter than the proboscis, 2- to 3-jointed. Often small, but usually well developed. It sometimes bears jaws in the young, and in one genus, *Ascorhynchus*, the jaws persist during the life of the individual. Second appendage, often longer than the snout, 6- to 10-jointed, but in most 2- to 4-jointed.

Third appendage occurs in both sexes, 10-jointed; sometimes coiled at the end, sometimes not; sometimes with spines, sometimes not. Sometimes these spines are toothed along the edges, sometimes not. The body is more or less elongate to concentrated, but segmented. There are 4 pairs of legs. The sex openings are in the 3rd and 4th pairs in the male and in all legs in the female.

### Genus *AMMOTHEA* Leach, 1914

#### Genus *ACHELIA* Hodge, 1864

Trunk, short, stout, segmentation usually lacking. Lateral processes so crowded that the body is disciform. The 1st segment is large, with a square frontal portion. Caudal segment not separated from trunk by a suture, narrow, nearly cylindrical, horizontal. The eye tubercle is near the front of the 1st segment, projects strongly, and bears distinct eyes. It is constricted at its base, fusiform with a circular constriction near its end, and pointed downward. Chelifori well developed, small, 2-jointed, the 2nd joint globose, chelate in the immature. Palpi 8-jointed, first 3 joints short, 4th longer. Ovigera relatively short, larger in the male,



without terminal claw, but with a few delicate spines and some stronger ones on the inner margins. Female genital openings on the 2nd coxal joints of all legs.

***Ammothea latifrons* Cole, 1904**

Plate 41

*Ammothea latifrons* Cole, Harriman Alaska Exp. N.Y., 8°, vol. 10, 1904, p. 263, pl. 11, fig. 3, pl. 16, figs. 1-9, pl. 17, figs. 1-3.

*Characteristics:* Broad trunk, with erect conical elevation with few spines at each corner. Suture lines faintly marked in front, lacking behind. Eye tubercle high, erect, bluntly conical. Caudal segment long and narrow. Chelifori much more than half the length of the proboscis. It bears marked tubercles and spines. Palpi 8-jointed, reach to well beyond the proboscis. Second coxa not much longer than 1st; 1st and 3rd, marked tubercles on the distal ends.

*Description*

*Body:* Trunk broad, especially anteriorly, each outer corner having an erect conical elevation bearing a few spines. Suture lines faintly marked in front, lacking behind. Lateral processes crowded, about twice as long as broad distally. On the dorsal border of these distal ends 3 nodules with 1 or more spines each.

*Eye tubercle:* On the extreme anterior edge of the 1st trunk segment, moderately high, cylindrical; the apex bluntly conical, eyes quite large, near the apex.

*Proboscis:* About as long as the trunk to base of caudal segment, broadly elliptical, truncated at the end. Dorsal border more convex than ventral, no circular constriction but longitudinal lines.

*Caudal segment:* Very long and narrow, as long as the proboscis. It reaches a little beyond the middle of the 2nd coxal joint of the posterior pair of legs. Not separated from trunk by a suture. It is directed somewhat downward. Its dorsal outline is irregular and bears a number of stout spines.

*Chelifori:* Much over half the length of the proboscis and thick. The 1st joint reaches to the middle of the proboscis. It bears tubercles on its dorsal side, and these bear spines. The 2nd joint small, spherical, with 1 or 2 spines. The chelifori are bent outward in the middle.

*Palpi:* Eight-jointed. Extend beyond the proboscis by about  $\frac{1}{3}$  of their length. Joints 2 and 4 are long, joint 2 the longer; the others are short. Basal joints have a few hairs; distal joints, many hairs.

*Ovigers:* Female, about as long as the palpi; 1st joint short, broad; 2nd comes off from the side of the 1st; 2nd and 3rd about equal and longer than 1st; 4th and 5th about equal and longest of all; 6th to 10th successively smaller; 10th very small and rounded; 7th, 8th, 9th, and 10th, each with 2 denticulate spines; 4th and 5th, few small hairs.

Male oviger nearly twice as long as the oviger of the female. First joint square, 2nd longer, 1st and 2nd broader than the following joints; 3rd longer than 2nd; 4th and 5th about equal, longer than 3rd; 6th to 10th successively smaller, except 9th, which is longer than 8th; 10th small, with 2 denticulate spines; 9th has one spine at least; 4th to 7th armed with short backwardly projecting spines in rows, while the following joints for a few divisions have 2 or 3 small hairs each. The end of the oviger is strongly curved inward. Egg masses rather small, globular, one mass to each oviger.

*Ambulatory legs:* Rather short. Second coxa not much longer than 1st and 3rd. First coxa has 3 tubercles on its dorsal edge, each with spines. Femur shorter than the coxal region and broad in the female, where it is equal to the width of the proboscis. Projecting distally from the dorso-distal border is a long conical extension bearing a strong spine. Tibial joints 1 and 2 are equal, thick, more or less armed with spines which are longer on the dorsal side. First tarsal joint is small, subtriangular, with short even spines. Tarsus 2 is moderately strong, arched with rows of slender spines dorsally and on the sides, and with 3 strong spines at the heel and a row of very short ones along the sole. The claw is about  $\frac{1}{2}$  the length of the 2nd tarsal. The auxiliary claw is well developed and about half as long as the large claw.

In the male the genital projection on the ventrodistal area of the 2nd coxa of the 2 last legs is thumblike and with 1 or 2 slender hairs. In the female the genital openings are on all 4 pairs of legs; length, 4; spread, 16; about the same size for both sexes.

Immature forms, but little smaller than the adults, have chelate chelifori and very short ovigers.

Cole's specimens were 2 males, 3 females, and 2 young from St. Paul's Island, Pribilofs; 1 male, 3 females, 2 young from Dutch Harbor, Unalaska.

This is distinguished from other species by its elliptical proboscis and long knobbed chelifori and caudal segment.

One female, Station 1177-40, north of Santa Barbara Island, Sept. 9, 1940, 37 fms.

***Ammothella bi-ungiculata* (Dohrn), 1881**

Plate 42

*Ammothella bi-ungiculata* Dohrn, Fauna and Flora Gulf Nap. Monag. III, Leipzig, 1881, 4°, pp. 158-160, Taf. 8.

*Ammothella bi-ungiculata* var. *californica* Hall, First Ann. Rep. of Laguna Marine Lab., 1912, pp. 93-95.

*Ammothella bi-ungiculata* Hilton, Jour. Ent. and Zool., vol. 8, no. 3, 1915; vol. 12, no. 4, 1920, p. 92; vol. 31, no. 2, 1939, p. 32.—Ohshima, Rep. de Bul. Sc. de la Fakultato Terkultara, Kjusii Imp. Univ., vol. 2, 15, 1927, pp. 610-612, 1 pl.; Proc. Imp. Ac. III, 1927, no. 9.

**Diagnosis:** Body and legs rather smooth, 2 tarsal claws. Segmentation of body evident. Eye tubercle rather low, blunt. Long, large proboscis.

**Description**

**Body:** Segmented, lateral processes moderately separated, moderate development, their length about half their diameter. Body rounded in front.

**Eye tubercle:** Low, broad, 4 eyes well pigmented.

**Proboscis:** Quite broad, smaller at the ends. Its length  $2\frac{1}{2}$  times its diameter and  $\frac{4}{5}$  the length of the body. It ends in an obtuse rounded angle as seen from above.

**Abdominal segment:** Small, cylindrical, less than  $\frac{1}{4}$  the length of the body, with a bluntly rounded tip. Anus in a notch at the end.

**Chelifori:** Short,  $\frac{1}{6}$  the length of the proboscis, 3-jointed. The 1st joint very short, not quite so long as the 3rd or last joint. Second joint about twice the length of the 1st. Third joint a little larger than the 1st, rounded. The thickness of the appendages a little less than that of the palpi.

**Palpi:** Nine-jointed, as long as the proboscis. First joint short and thicker than the others. Second joint 4 times as long as the 3rd, 4th almost as long as the 2nd, 5th and 6th about as long as the 3rd. Terminal joints decrease in order. Few hairs on any joints except the last.

**Ovigers:** Slightly longer and wider than the palpi. In order of length, except the first, which is shorter and thicker, they are 4th, 5th, 6th, 3rd, 7th, 8th, 9th, and 10th. The terminal joints are spirally rolled, and on the tip of the last are 3 stiff plume hairs. There is a similar hair on each side of the 8th joint.

*Ambulatory legs:* Rather long, stout, no tibial process, few hairs except on the tarsus. First coxal as long as wide, 2nd twice as long, 3rd  $1\frac{1}{2}$  times the length of the 1st. Femur about as long as the combined length of the 2nd and 3rd coxals. Second tibial joint about the length of the femur, 1st slightly shorter. Second tarsus less than half as long as the 2nd tibial joint. There is a double row of fine hairs along the sole and a few longer ones on the end. No terminal claw, 2 auxiliaries well developed.

*Measurements:* Body length, 1.3; proboscis, 1.05; abdomen, 0.36; leg, 4.2; lateral processes, 0.214. Other measurements as given by Hall were as follows: length, female type, 2.85; male, 2.5; maximum, female, 2.85, male, 1.38. Proboscis, female, 1.15; male, 0.9; maximum, male, 0.96. Body, female type, 1.35; male, 1.15. Caudal segment, female type, 0.3; male, 0.24. Transverse process, female type, 0.66; male, 0.75. Third leg, female type, 4.5; male, 3.5.

*Color:* Light straw.

About 20 specimens were first reported by Hall from under stones, at low tide, Laguna Beach, California, 1912, and over 50 specimens in 1912 from a similar locality. I have found this species every summer for the last 25 years at Laguna Beach or near by. I have found it also at the Isthmus at Catalina Island, under stones, and below Ensenada, Lower California, perhaps several hundred in all. It is usually found under stones at low tide among hydroids, bryozoans, and sponges. Also several from the Hawaiian Islands.

*Measurements* of a Laguna Beach female specimen: Length of body, 1.4 by 0.625, of which the lateral processes are on each side. Proboscis, 1.2 long by 0.5 across the center, 0.25 across the tip, and 0.35 at the base. Ocular elevation, 0.175 high by 0.028 across. Abdomen, 0.3 long by 0.055 at the base, and 0.12 in the middle. Chelifori, 1st joint, 0.075; 2nd, 0.25; 3rd, 0.3; 4th, 0.2; 5th and 6th, 0.03; and last joint, 0.075. The oviger was 0.1, 1st joint; 0.225, 2nd; 0.1, 3rd; 0.3, next; 0.2, next; 0.150, next; 0.1, next; 0.075, each next; and 0.05, the last. The legs were as follows: 1st, 0.15 long by 0.225; 2nd, same; 3rd, 0.5 by 0.225; 4th, 0.35 by 0.2; next, 0.7 by 0.3; next, 0.875 by 0.14; next, 0.075 by 0.075; last joint, 0.4 by 0.125. The claws were 0.1 by 0.025 at base.

Portuguese Bend, California, March 11, 1938, shore. Tom Burch, collector.

***Ammothella heterosetosa*, new species**

Plate 43

*Characteristics:* Body moderately heavy for the size. Scattered spines over the body surface. Chelifori nearly as long as the large proboscis. On each of the 2 long joints is a row of long, large, flat hairs; on the surface are small hairs and very small forked spines.

*Description*

*Body:* Moderately heavy for the size. Scattered spines or fine hairs over the surface. Lateral processes well developed but shorter than the body between. Suture lines between segments well marked and slightly chitinized.

*Ocular segment:* Well developed, almost as long as the rest of the body. Ocular tubercle, a rather high mound. The eyes are not well pigmented.

*Proboscis:* Not quite so long as the body and nearly as wide as the body, oval in outline, narrowed some at the base to the tip.

*Abdomen:* Moderate length. It reaches just beyond the last pair of transverse processes.

*Chelifori:* Three-jointed. Nearly as long as the proboscis. The 1st joint is a little shorter than the 2nd. The last is small and conical. The long joints bear on each edge a row of long, large, flat hairs; on the surface are small hairs; and very small forked spines are scattered among the circular spots.

*Palpi:* Nine-jointed. Basal joints rather heavy; the joints, especially the last, small. A few hairs are found on these, and 2 serrate spines on the 9th.

*Ambulatory appendages:* Quite heavy, especially the 2 basal coxae. Femur rather short, 2nd tibia longer than the 1st. First tarsus well developed. A spine above and several below. Second tarsus not quite half so long as the 2nd tibia, a little thick. Bears a short, heavy claw and paired claws. Ventrally it bears 4 or more broad teeth near the base and several more slender ones farther on. It also has several long hairs dorsally. The 1st and 2nd coxae bear a number of flat, long hairs laterally. The 3rd has 4. There are some on the long joints, but shorter ones predominate toward the end, especially on the 2nd tibia.

Type, 1 male with eggs, U.S. Nat. Museum no. 306, Marchena Island, Galapagos Islands, shore, reef north end of Island, December 2, 1934, Hancock Expedition. This species is distinguished by the character of the setae on the appendages and body. Many of the largest ones are

broad, flat, and quite long. There are also many spines on all parts; the hairs are large and small, often flattened; and there are also peculiar little 2-branched spines, especially on the chelifori.

The chelifori are broad and covered with an unusually thick lot of flat hairs. The palpi are 9-jointed and long, not very hairy. The segment lines are strongly chitinized. The position of the last transverse processes is rather unusual. The terminal joint of the 3-jointed chelifori is unusual.

*Color:* Pale straw.

*Measurements:* Base of chelifori to 1st segment line, 0.4; between segmentation lines, 0.15; from the 3rd line to the end of the last transverse process, 0.25. Proboscis, 0.85 by 0.2 to 0.45. Total length of the body, 1.8; lateral process width, 0.2; body between, 0.4; total body width, 0.8; under level, 0.15 by 0.15. Chelifori, 1st joint, 0.4 by 0.1; 2nd joint, 0.35 by 0.075 to 0.1. Palpi, 1st joint, 0.125 by 0.1; 2nd, 0.2 by 0.875; 3rd, 0.35; 4th, 0.2; 5th, 0.2 by 0.175; 6th, 0.175 by 0.4; 7th, 0.1; 8th, 0.125; 9th, 0.175 by 0.025. Oviger, 1st joint, 0.2 by 0.175; 2nd, 0.25 by 0.1; 3rd, 0.175 by 0.1; 4th, 0.375 by 0.075; 5th, 0.4 by 0.075; 6th, 0.1 by 0.075; 7th, 0.175 by 0.075; 8th, 0.075 by 0.05; 9th, 0.05 by 0.05. Ambulatory appendages, 1st joint, 0.275 by 0.2; 2nd, 0.3 by 0.1 to 0.2; 3rd, 0.3 by 0.2; 4th, 0.5 by 0.2; 5th, 0.65 by 0.1 to 0.2; 6th, 0.65 by 0.175; 7th, 0.075 by 0.075; 8th, 0.2 by 0.1. Spread, 6.6.

### Genus **Nymphopsis** Haswell, 1885

"First pair of appendages well developed cheliform. Second pair well developed with 9 joints. Third pair with 7 joints, none provided with compound spines." The above is Haswell's description of the genus. It is quite evidently incomplete and not inclusive enough. The 1st pair of appendages is not always chelate, although the last joint suggests it often. The compound spines of the body and appendages are characteristic, together with the long abdomen with its characteristic spines.

### **Nymphopsis spinosissima** (Hall 1912)

Plate 44

*Ammothella spinosissima* Hall, First Laguna Report, 1912.—Hilton, Jour. Ent. and Zool., vol. 8, no. 2, 1915, p. 67; vol. 12, no. 4, 1920, p. 92; vol. 31, no. 2, 1939, p. 72; vol. 31, no. 4, 1939, p. 31. —Hedgpeth, Amer. Mid. Nat., vol. 22, no. 2, 1939, pp. 461-463, pl. 2.

*Characteristics:* Body nearly disclike, 3 strong spines on the middle line of the dorsal side. Segmentation lines not distinct. Chelifori with compound spines. Abdomen with a linear series of compound spines. Three basal teeth on the 2nd tarsus of the legs. Tufts of spines, 2 for each transverse process of the body at their distal margins.

*Description*

*Body:* Almost circular in outline. Hall describes the lateral processes grown together throughout their length. I have examined many specimens which agree with Hall's description in every other respect in this well-marked species, but have never found any of the lateral processes really fused. They are often very close to each other and even filled with dirt so as to resemble this condition, but in every case more careful examination revealed a true separation between these processes.

There are no intersegmental lines. Lateral processes are strongly developed, each bearing 1 to 2 tufts of spines. In the center of the back is a row of 3 large erect processes, each bearing numerous spines.

*Eye tubercle:* Relatively small, length about twice the diameter. Eyes not deeply pigmented.

*Proboscis:* Shorter than the apparent length of the body but actually longer, because it arises underneath and back. It is bluntly rounded in front, with a notch at the tip. Its diameter is about half its length.

*Abdominal segment:* About  $\frac{3}{4}$  the length of the body. Along the upper side of the abdomen is a row of long projections bearing spines. The diameter of the abdomen is about  $\frac{1}{5}$  its length.

*Chelifori:* Short, slightly longer than the proboscis or reach out beyond it. The appendage has a number of complex spine-bearing processes. The basal segment is about the size of the 3rd terminal segment. The 2nd segment is about  $1\frac{1}{2}$  times as long as the other two combined.

*Palpi:* Nine-jointed, extending beyond the proboscis about  $\frac{1}{3}$  their length. First joint is shorter and broader than the others. The 2nd is longest, almost  $\frac{1}{3}$  the whole appendage; 3rd, very short; 4th, not quite so long as the 2nd. A ridge across the 4th makes it appear like 2 joints as viewed from above. The terminal joints diminish in length. There are a few hairs on the first 6 joints, but the terminal joints have many. The 2nd joint is thickened at the ends. The average diameter of the appendage is about  $\frac{1}{2}$  the chelifori.

*Ovigers:* Nine-jointed, their diameter between that of the last 2 appendages described. The joints in order of their length are as follows: 4, 2, 5, 3, 6, 7, 8, 9, 1. The terminal joints bear a number of rather long

hairs. The eggs are 0.125 mm. in diameter and 6 or more small bunches on each oviger of the male.

*Ambulatory legs:* Rather short, strong, with numerous spines on appendages and especially on the coxal and tibial joints. On the 2 tibial joints of each leg these compound spines are arranged in a double row down the upper side of the joint. The 1st and 3rd coxal joints are equal in length, the 2nd about half as long. The femur is as long as the combined lengths of the 3 coxae. The tibial joints are each as long as the femur, but slightly longer than the tarsus. The claw is over  $\frac{3}{4}$  the length of the tarsus. There are no auxiliary claws. Length of the proboscis is 1.42; body, 1.2; abdomen, 1.1; leg, 6.35; lateral processes, 0.5.

This species was described from a single specimen obtained from *Fucus* in July, 1911, at Laguna Beach.

Two other specimens were obtained by Hall in 1912, one from *Fucus*, another from under a stone.

I have collected a large number of these from Laguna Beach, but almost always from under stones at low tide. I think their occurrence on brown algae is somewhat accidental. Mostly they are under stones among bryozoans, small sponges, or hydroids and are often covered with debris.

*Color:* Light brown.

*Measurements* of a Laguna Beach specimen are as follows: Body length and breadth, 3.5. Proboscis, 1.3 long by 0.55 wide. Chelifori, 1 long. Palpi, 1st joint, 0.15; 2nd, 0.7; 3rd, 0.2; the rest, 0.8 long. Ovigera, last joint, 0.1; next to last, 0.25; next, 0.2; next, 0.3; next, 0.65 by 0.16; next, 1.05 by 0.1; next, 0.85 by 0.1; next near basal, 0.8 by 0.275. Abdominal segment, 1.05 long by 0.2 at base, 0.15 farther along; the spines are from 0.1 to 0.275 to 0.5 in length. The dorsal spines of the body are 0.425 long by 0.15 at base and 0.075 at tip. Spread of legs, 33.5.

I have a large number of this species collected from Laguna Beach during the last 25 years. They were never abundant, but were found every season.

One female, Station 491-36, Rosario Bay, Lower California, Mexico, sand and kelp, February 15, 1936, 10-15 fms.

Specimens also from Santa Cruz Island. Specimens from San Mateo Co. Thurloe Bay, Lower California, Mexico, dredged 30 fms. One young (female?).

One specimen, Station 893-38, off Pt. Arguello, 34° 34' 20" N., 120° 40' 00" W., Aug. 9, 1938, 15-30 fms.



***Nymphopsis duodorsospinosa*, new species**

Plate 45

*Characteristics:* Body nearly disc shaped in outline, slightly elongate. Two sharp mid-dorsal spines. Leg joints, especially the longer, with compound spines. Abdomen with a few long, mostly simple spines.

*Description*

*Body:* Smooth except the hairs or spines at the ends of the processes and the 2 large, prominent vertical dorsal spines which also bear spines on the sides. Transverse processes much longer than the width of the body between. There are no suture lines between body segments. Body a little longer than broad.

*Ocular segment:* Well developed, broad, but not more than a third the length of the rest of the body.

*Ocular tubercle:* Cylindrical, high vertical, bears 4 black eyes near tip, placed a little back of the forward end of the body.

*Proboscis:* Cylindrical, a little narrowed at the base, rather slender, slightly truncate at the end. Three times as long as wide.

*Abdominal segment:* Long, curved, extends at a slight angle backward. It bears about 4 scattered spines up to its central part and 2 sharp compound spines nearer the end, all on the dorsal side. There are a few fine spines near the tip ventrally. It extends well beyond the last transverse process.

*Chelifori:* Three-jointed, the 1st short, cylindrical, the 2nd narrow at the base, long at the end, trumpet shaped, bearing a large lateral spine and series of sharp hairs along its distal end, which is like a rim which encloses the small 3rd joint, which fits into the end of the trumpet-shaped 2nd joint.

*Palpi:* Nine-jointed, the 1st small, the 2nd and 4th long. The 2nd bears a few fine hairs near its end. The 3rd is small, about like the 1st. The 4th bears 3 sharp spines on its inner margin, and several on the outer margins include a small fleshy point. The distal end of this joint is very hairy. The remaining joints are small and bear tiny hairs, especially at the end of the last and on the outer sides of the others. This appendage is much more slender than the chelifori.

*Ovigers:* Nine-jointed. The 1st is short and rather thick, the 2nd is long and thick, the 3rd and 4th are long, slender, and curved, especially the 3rd. The 5th is short, thick, and covered on all sides with small hairs. The next 3 joints are more slender but of similar length. All have many tiny hairs. The 9th joint is very small and ends in 2 small, sharp spines.

*Ambulatory appendages:* Moderately long, moderately heavy, with many complex spines. The 1st and 3rd coxal joints are smaller than the 2nd. The femur and 1st tibia are about the same length. The 2nd tibia is longer. The 1st tarsus is moderately developed, the 2nd is heavy, somewhat curved, about half the length of the 2nd tibia. The unpaired claw is  $\frac{2}{3}$  the length of the 2nd tarsus. At the basal joint of the 1st tarsus there are several strong teeth. At the basal ventral part of the 2nd tarsus there are 3 strong teeth, followed by an even row of 15 or more regular, rather smaller teeth or hairs. This joint bears a few lower hairs dorsally and laterally.

*Color:* Straw, with lighter brown in the heavily chitinated parts.

There is a little knob bearing spines in each transverse process dorsally on its distal end. The 1st coxal joint bears a number of compound spines directly at its distal end. The 2nd coxa bears several spines. The 3rd coxa bears a few short hairs about its margin. The femur is curved, bellowed out dorsally, and projects vertically. In the middle of the shaft laterovertically is a pair of large upward-extending spines. There are a few scattered compound spines here and there, and at the distal end near the joint there are 3 large compound spines with 1 or more smaller ones behind each of the larger. The 1st tibia bears 2 areas of large spines on its upper margin, 6 or more at the proximal end, 3 being especially large, composed of at least 4 large distal spines, a few smaller ones in rows, and a few short hairs. The 2nd tibia bears a group of large compound spines of various lengths, especially on its proximal end. There are about 8 of these, approximately in 2 rows, the vertical ones being the largest. There are a few scattered spines, mostly smaller toward the distal end on the outer side. The under sides of the 2 tibiae bear many fine hairs, especially numerous on the 2nd tibia.

*Type:* A female from a group of three, U.S. National Museum, no. 532, in the San Francisquito Bay, Lower California, sand and kelp, March 2, 1936, 26 fms., Hancock Expedition, accession no. 139772. Another male of the same species with eggs, U.S. National Museum, Marchena Island, Galapagos, shore, reef and spit, north end of Island, December 2, 1934, Hancock Expedition, no. 131571. This species resembles *N. spinosissima* most closely. It differs in having 2 dorsal spines instead of 3. It also has a cheliforus more trumpet shaped, with the 3rd joint hidden. Its abdominal appendage does not have so many spines, and the spines on the legs, although quite similar in arrangement, have many differences. The little limbs with spines on the dorsal distal surfaces of the

lateral appendages are also different. The lateral appendages are longer and better separated in this new species. The spines on the feet differ also, and the ocular tubercle in the new species is much larger and more prominent.

*Measurements:* Base of chelifori to end of 1st joint of legs, 1.2. Total length to end of last transverse process, 3. Length of proboscis, 2 by 0.8. Total length of body and proboscis, 5. Length of lateral process, 1.1. Width of body below, 0.4. Total width of body, 2.9. Length of abdomen, 0.2 to 0.4. Chelifori, 1st joint, 0.3; 2nd, 1.5; 3rd, 0.1. Palpi, 1st joint, 0.15; 2nd, 1.1; 3rd, 0.15; 4th, 0.16; 5th, 0.3; 6th, 0.4; 7th, 0.2; 8th, 0.5; 9th, 0.4. Ovigera, 1st joint, 0.5; 2nd, 1; 3rd, 2.5; 4th, 0.1; 5th, 0.5; 6th, 0.3; 7th, 2.5; 8th, 0.2; 9th, 0.05. Ambulatory legs, 1st joint, 0.1; 2nd, 0.2; 3rd, 1.4; 4th, 3; 5th, 2.5; 6th, 2.5; 7th, 0.3; 8th, 1.5; under claw, 1. Spread, 29.3.

### Genus EURYCYDE Schödte, 1857

Body relatively compact, with well-defined segments and unusually long lateral processes. Cephalic segment with little-developed frontal part and strongly prominent cervical process for attachment of the ovigera. Caudal segment horizontal, fusiform, expanded in its outer part. Ocular tubercle narrow, marked, distinctly marked eyes. Proboscis of medium size and fusiform, articulated by narrow neck, curved inward on the ventral side. Well-marked joint in the proboscis. Chelifori narrow, 2-jointed. Palpi greatly elongated, curved, 10-jointed. Ovigera usually 10-jointed, marginal spines in a double series serrated, terminal claws distinct. Ambulatory legs slender, with strong bristles. Coxal joints of the female swollen. Tarsal joint very small. Terminal claw short, without auxiliary claws.

### *Eurycyde longisetosa*, new species

Plate 46

*Diagnosis:* Body compact, appendages slender, bearing very long hairs. Ocular tubercle cylindrical, with 2 very long hairs near the tip. Low teeth on the 2nd coxa below.

#### *Description*

*Body:* Rather compact, free from hairs, but granular. Suture lines well marked. Transverse processes well developed, not fused but very

close together, especially those of the 1st and 2nd pairs of ambulatory legs. Lateral processes about the width of the body between, transverse processes without spines or hairs.

*Ocular segment:* Well developed, narrow in front where it bears the chelifori. A little longer than the next 2 segments.

*Ocular tubercle:* High, cylindrical. It bears deeply pigmented eyes in its middle portion and has 2 very long hairs projecting from its end.

*Proboscis:* Two-jointed, the 1st cylindrical, shorter than the 2nd, which is bent upon it. The 2nd joint is thick in the center and tapers at the ends, especially the tip. In its central portion it is more than half as broad as long.

*Abdominal segment:* Long, cylindrical. It is larger than the 1st coxa and nearly as long as the 2nd coxa, including the length of the transverse process. It is much narrower than any and bears 6 very long hairs near its end.

*Chelifori:* Three-jointed, slender, but shorter than the palpi. The first joints are about equal in length, the 2nd is very much smaller. The 2nd joint bears 5 very long hairs which extend out laterally. The last joint bears 3 very long hairs.

*Palpi:* Ten-jointed. More slender than the chelifori. The first 2 joints very short, especially the 2nd. The 3rd and 5th are the longest. The rest are all small and bear hairs.

*Ovigers:* Ten-jointed. The first 2 joints are short; the 3rd is a little longer; the 4th and 5th are the long joints; the 6th is about half as long as the 5th. The remaining joints are small and bear 4 or more slender teeth on their inner margins. The last joint has 1 or 2 terminal or nearly terminal teeth. The last 5 joints all bear a few long hairs on their outer surfaces. The eggs were small—about 0.1 mm. in diameter.

*Ambulatory appendages:* The legs are moderately long and slender, especially the long joints. The coxal joints are nearly the same size. The femur is shorter than the tibial joints. The 2nd tibia is especially slender. The 1st coxal joint bears 2 large lateral spinelike processes. The 2nd and 3rd coxae bear rather long hairs. The femur bears a group of very long hairs at its distal end. The 1st tibia bears 2 groups of very long hairs, a few of which are plumelike.

The 2nd tibia bears several very long hairs in 2 groups of about 3 each, a few of which are plumelike. The 1st tarsus is well developed, is cylindrical, and has no long hairs. The 2nd tarsus is more than half as long as the 2nd tibia. It is thicker than the tibia in its center, but is

rather straight. It ends in a rather short, prominent claw. It bears several long hairs on its upper surface and slight indications of sinisterlike claws on its lower surface. Type of male from a lot of 3 males with eggs. U.S. National Museum, Station 423-35, Point Utria, Colombia, close to shore, north of Point, north of island, January 25, 1935, 20 fms., accession no. 131571. This species is much like *E. hispada* Kroyer, but the hairs seem very much longer, some 0.5 mm. or longer. In *hispada* no hairs are seen on the ocular eminence. There are 2 in this species. The 1st coxal joint does not have the long processes of this species. The hairs on the legs of this species are fewer, larger, and differently arranged.

*Measurements:* Base of the chelifori to 1st segment lines, 0.45; between 1st and 2nd segment lines, 0.2; 2nd and 3rd segment lines, 0.2; 3rd line to the end, 0.2. Total length not including proboscis, 1.05. Length of transverse process, 0.35; body width between transverse processes, 0.25; total body width, 0.95. Proboscis, 1st joint, 0.36; 2nd, 0.54 long by 0.12 to 0.3. Abdomen, 0.48 by 0.06 to 0.08; hairs on abdomen, 0.5. Ocular eminence, 0.225 by 0.1; hairs, 0.3. Chelifori, 1st joint, 0.3 by 0.075; 2nd, 0.30 by 0.04; 3rd, 0.075 by 0.05; hairs, 0.22. Palpi, 1st, 0.075 by 0.1; 2nd, 0.025; 3rd, 0.4 by 0.04; 4th, 0.125; 5th, 0.25; 6th, 0.075; 7th, 0.075; 8th, 0.075; 9th, 0.065; 10th, 0.065. Ovigera, 1st joint, 0.1 by 0.1; 2nd, 0.15 by 0.1; 3rd, 0.175 by 0.087; 4th, 0.45 by 0.075; 5th, 0.4 by 0.088; 6th, 0.3 by 0.25; 7th, 0.15 by 0.075; 8th, 0.15 by 0.05; 9th, 0.1 by 0.05; 10th, 0.1 by 0.065. Ambulatory legs, 1st joint, 0.2 by 0.15; 2nd, 0.2 by 0.1 to 0.2; 3rd, 0.2 by 0.15; 4th, 0.575; 5th, 0.85; 6th, 0.85; 7th, 0.675 by 0.04; 8th, 0.5 by 0.05 to 0.052. Claw, 0.25 by 0.037.

### Family *Pycnogonidae* Dohrn

The cheliforus or first appendage pair is lacking. The palpus or 2nd appendage pair is lacking. The ovigera or 3rd appendage pair is found only in the male. It is 10-jointed, the last joint is a terminal claw. The body is compact, the legs thick and comparatively short. There are usually 4 pairs of legs, sometimes 5. The sex openings in both sexes are in the 4 legs, in the last 4 if there are 5 pairs of legs.

### Genus *PYCNOGONUM* Brunnich, 1764

Trunk stout, legs short, ovigera only in the male. First tarsal joint small. Claws simple.

***Pycnogonum hancocki* Schmitt, 1934**

Plate 47

*Pycnogonum hancocki* Schmitt, Jour. Wash. Acad. Sci., vol. 24, 1934, pp. 65-67, fig. 2.

*Diagnosis:* Color light tan, with marked brownish reticular marks. Three rounded tubercles on the middle line of the body. Legs rather smooth, not with rounded knobs.

*Description*

*Trunk:* The 1st segment is equal to the 2nd, 3rd, and 4th combined. Its greatest width over the lateral processes. The greatest width of the 2nd segment is equal to the length of the first 2 trunk segments taken together. The 3rd segment is about as wide as the length of the 1st trunk segment together with  $\frac{1}{3}$  of the 2nd. Caudal lateral processes are fused for part of their length.

In a line behind the moderately high, rounded ocular tubercle are 3 rounded tubercles, each smaller than the ocular. That of the 3rd trunk segment is the larger. The 1st is at the caudal margin of the 1st trunk segment. The 2nd, a little larger than the 1st, has a similar position, and on the last segment there is very slight indication of an elevation. The distal margins of the lateral processes are slightly more coarsely granulated than the rest of the body surface.

*Caudal segment:* This is not conspicuous. It is about  $\frac{2}{5}$  the proboscis in length and projects beyond the caudal line of the rather large lateral process of the 4th pair of legs.

*Eye tubercle:* The eye tubercle is about half as high as the median dorsal tubercles and is provided with 4 dark eyes.

*Proboscis:* This is nearly cylindrical, truncate, and a little narrower in front than behind. It is about  $2\frac{1}{4}$  times as long as its greatest width. It is very slightly longer than the first  $2\frac{1}{2}$  segments taken together.

*Ambulatory legs:* The distal margins of the 1st coxae of all the ambulatory legs are a little enlarged, owing to a small nodule on either side of the brown line of the reticulations which divide the white area in two. At about the distal portion of the proximal half of the 2nd coxae of the 2nd and 3rd legs there is a small nodule of size similar to the last mentioned. The 2nd coxa of the 1st leg lacks this elevation, the 2nd coxae of the 4th pair each have a pair of small rounded tubercles, one on the mid-dorsal line, and the other transversely in the line a little behind the median axis of the joint. The rest of the leg joints are uniformly granu-

late as is the rest of the body. In the 3rd leg the 3 coxal joints are more or less subequal in length as are the femoral and 1st tibial joints.

The 2nd tibial joint and the 2nd tarsal joint, not counting the claw, are about the same length. On the ventral measurements the 1st tarsal joint is very slightly longer than the terminal claw. The 2nd tibial joint is about  $\frac{2}{3}$  the length of the 1st, and both coxal joints are equal to  $\frac{3}{4}$  the femoral joint in length. The inferior borders of the tarsal joints, and to a less degree the distal ends of the tibial joints, are finely spinulate.

*Color:* Light tan, with reticular marks, deep red brown. Ocular tubercle dark, with deeply pigmented eyes.

I have examined one specimen, a male from Santa Cruz Island of the Galapagos group. This specimen carried a single bunch of eggs which occupied about all the ventral area of the animal. The eggs were just a shade under 0.1 mm. in diameter.

*Measurements:* Total length, 6.25. Proboscis, 3 long by 1 wide. First body segment, 1 long; 2nd and 3rd segments, the same as the 1st; 4th, 1.25. Width of the central part of the body, 1.5; lateral appendages, 1 on each side of this. Ambulatory legs a little longer in front, the posterior legs progressively shorter after the 1st pair. Length of joints in the 1st leg, 1st joint, 0.75 by 1 broad; 2nd, 0.7 by 1; 3rd, 0.7 by 0.75; 4th, 1.5 by 1; 5th, 0.2 by 1; 6th, 1.25 by 0.75; 7th, 0.25 by 0.25; 8th, 0.1 by 0.3. Claw, 0.5 by 0.2. The ovigers, not previously described, are 8-jointed, counting the large terminal claw as one. In measurements the joints are as follows: 1st joint, 0.175 by 0.2 broad; 2nd, 0.15 by 0.175; 3rd, 0.3 by 0.3; 4th, 0.4 by 0.3; 5th, 0.35 by 0.15; 6th, 0.4 by 0.425; 7th, 0.275 by 0.175. The claw is 0.25 by 0.75 at the base.

This species differs from many other forms of the same genus because of its reticulation. It also has fewer tubercles on the legs than *P. indicum*, *madagascarensis*, and *mucronatum*. It differs from the first in lacking the armed ridge back of the ocular tubercle and in having a subcylindrical proboscis instead of a conical one. It also has very low dorsal tubercles.

Schmitt describes the species from a female taken with a smaller male with eggs, collected at low tide on a small rocky reef, off shore north of Tagus Cove, Albemarle Island, Galapagos, lat.  $0^{\circ} 14' S.$ , Station 65-33, Feb. 9, 1933. It measured: proboscis, 2.4 by 0.9; trunk, not counting lateral processes, 2.6; caudal segment, 1.

Two other females were one from Chatham Island, Jan. 31, 1933, from dredging 2-3 fms., east of Wreck Bay, Station 41-33, and one, Station 59-33, from a rocky shore east of Cormorant Point, Charles Island,

Galapagos, Feb. 6, 1933. One male, Station 65-33, Feb. 9, 1933, from a reef on Albemarle Island, north of Tagus Cove, Galapagos. The body was 3.5; the proboscis, 2.5; the spread, 10. Found on a sponge.

Two females with body length, 3.5; proboscis, 3, Station 81-33, Indefatigable Island, Conway Bay, Galapagos, Feb. 17, 1933.

Seven males and 7 females, the largest female, 4; proboscis, 2.5. Several of both sexes were very light colored. South Seymour Island, Galapagos, Jan. 14-18.

One male, length, 3.5; proboscis, 2, Station 333-34, James Island, shore, rocky ledges, 2 miles south of James Bay, Dec. 11, 1934.

One male, Station 65-33, Albemarle Island, reef north of Tagus Cove, well out from shore, U.S.N.M. accession no. 122445, Galapagos Islands, Feb. 9, 1933.

One male, young, Station 214-34, Cape San Francisco, Ecuador, dredging near rocks, mud and rocks, 2 fms., Feb. 11, 1934.

Fourteen females, 18 males, Station 10, James Bay, Galapagos, Jan. 11, 1932.

Four specimens, Duncan Island, Galapagos, *Albatross* voyage, 1887-88, Apr. 13.

Two males, 3 females, Station 85-33, North Seymour Island, Galapagos, shore collecting, under rocks and crevices, Feb. 18, 1933.

Eleven females and young, Station 82-33, Conway Bay, Indefatigable Island, Galapagos, small island, shore, Feb. 17, 1933.

### ***Pycnogonum panamum*, new species**

#### Plate 48

*Diagnosis:* Brown, reticulated. Proboscis rather pointed at the end. The proboscis is longer than the body.

#### *Description*

*Body:* Rather heavy, disc shaped. Lateral processes short, not widely separated. The dorsal spines as long or higher than the ocular tubercle.

*Ocular segment:* Short, not much longer than the 2nd segment.

*Ocular tubercle:* Moderately high, pointed, eyes dark, well developed.

*Proboscis:* Long, tapering toward the tip, and bent under slightly; longer than the total length of the body. Reticulated in squarish areas, a dozen or more from the base to the tip.

*Abdomen:* Short, broad, extending from the last transverse processes to beyond the 1st coxal joint. Provided with a few small hairs.



*Ovigers:* Slender, the joints not very different in length. The 5th and 7th joints seem the longest.

*Ambulatory appendages:* Rather short and heavy. The 1st joint is about like the 3rd coxal joint. The femur and tibiae are not very long, the first two longer than the 2nd tibia. The 1st tarsus is rather short; the 2nd is nearly as long as some of the long leg joints. All the joints except the last two are reticulated, marked by dark brown lines.

The claws are about half as long as the last tarsal joints.

*Color:* Brown. Reticulated.

This species is nearest to *Pycnogonum hancocki* Schmitt, found in many places about the Galapagos Islands, but differs in having the proboscis longer than the body. It is also of different shape, being narrowed toward the tip in this species and bent downward. The reticulations differ in the 2 species, and the claws are long in this species.

*Material:* Type, a male, Station 249-34, Bahia Honda, Panama, outside of isle south of Bay, Feb. 22, 1934, dredged, 15-20 fms. Another male, Station 457-35, Secas Islands, Panama, Feb. 6, 1935, 12 fms.

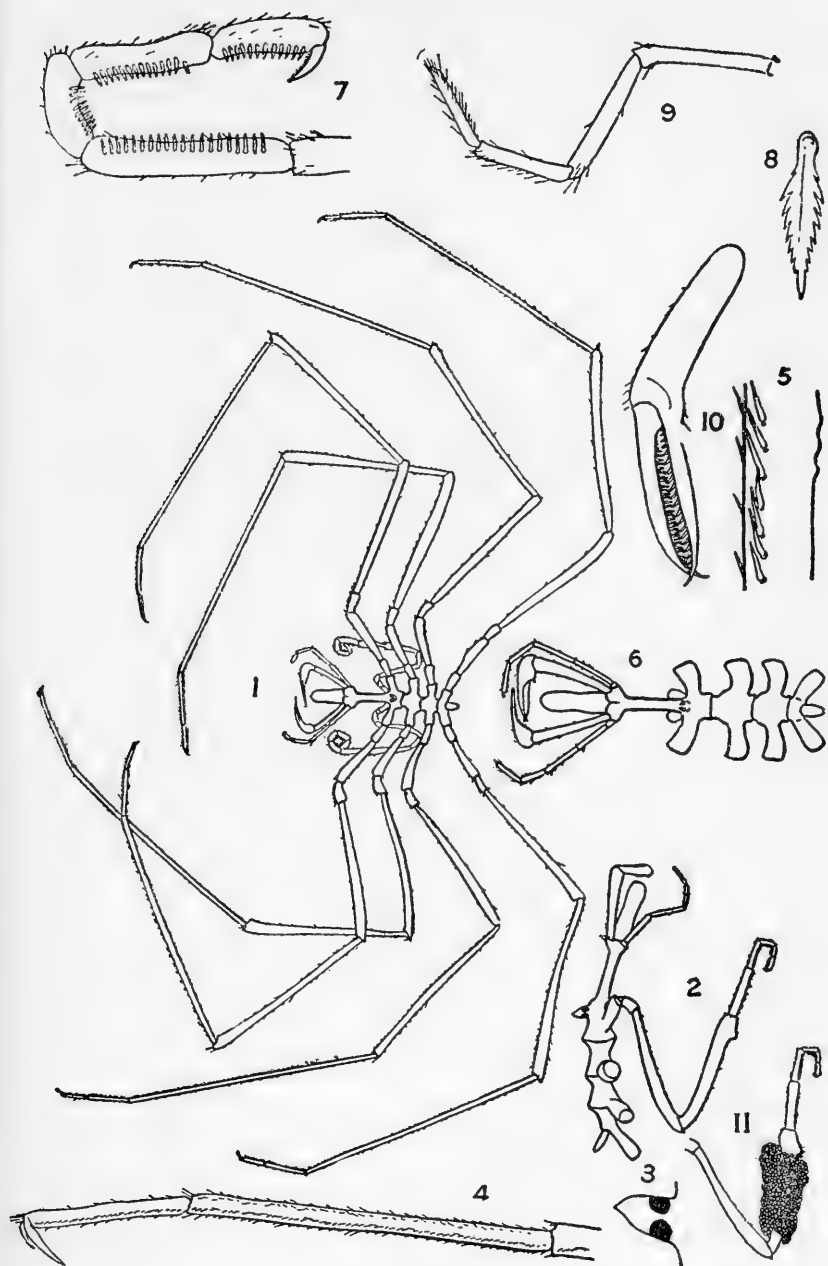
*Measurements:* Length of body from front line to end of last lateral process, 1.92; width of the body between processes, 0.48; length of lateral process, 0.36; total width, 1.2. Length of proboscis, 1.8; width at base, 0.48; at tip, 0.36. Leg, 1st joint, 0.36 by 0.48; 2nd, 0.48 by 0.36; 3rd, 0.36 by 0.36; 4th, 0.84 by 0.36; 5th, 0.96 by 0.36; 6th, 0.72 by 0.24; 7th, 0.12 by 0.12; 8th, 0.72 by 0.12 to 0.18. Claw, 0.36 by 0.06. Spread, 10. Oviger, 1st joint, 0.10; 2nd, 0.15; 3rd, 0.10; 4th, 0.15; 5th, 0.20; 6th, 0.15; 7th, 0.20; 8th, 0.1.



## PLATE 35

*Nymphon pixellae* Scott (after Scott).

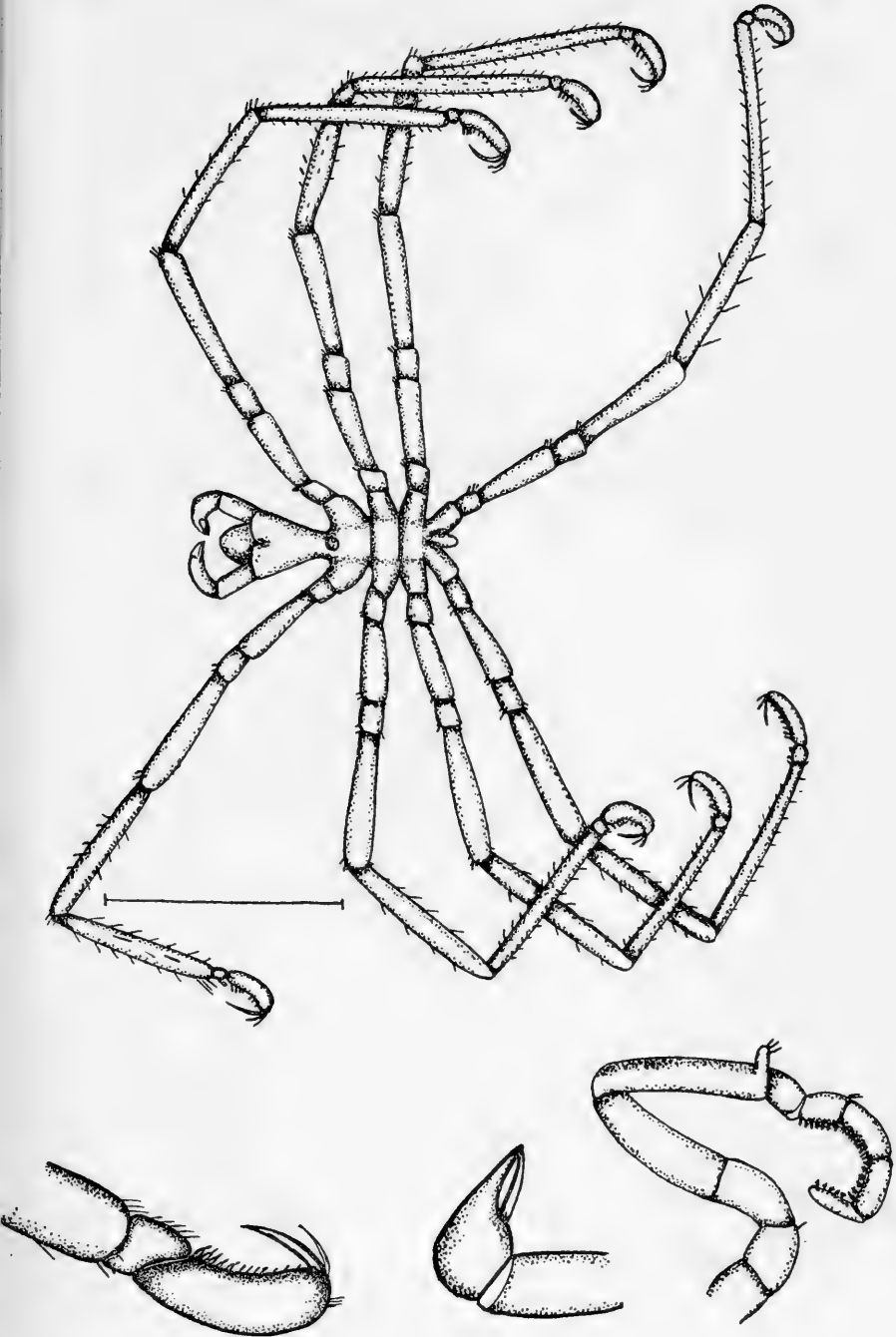
1, dorsal view; 2, profile view; 3, ocular tubercle; 4, terminal joints of leg; 5, spines on terminal joints of leg; 6, dorsal view, walking-legs removed; 7, terminal joints of ovigerous leg; 8, spine of oviger; 9, palp; 10, chela; 11, oviger with egg-mass.



## PLATE 36

*Callipallene californiensis* (Hall).

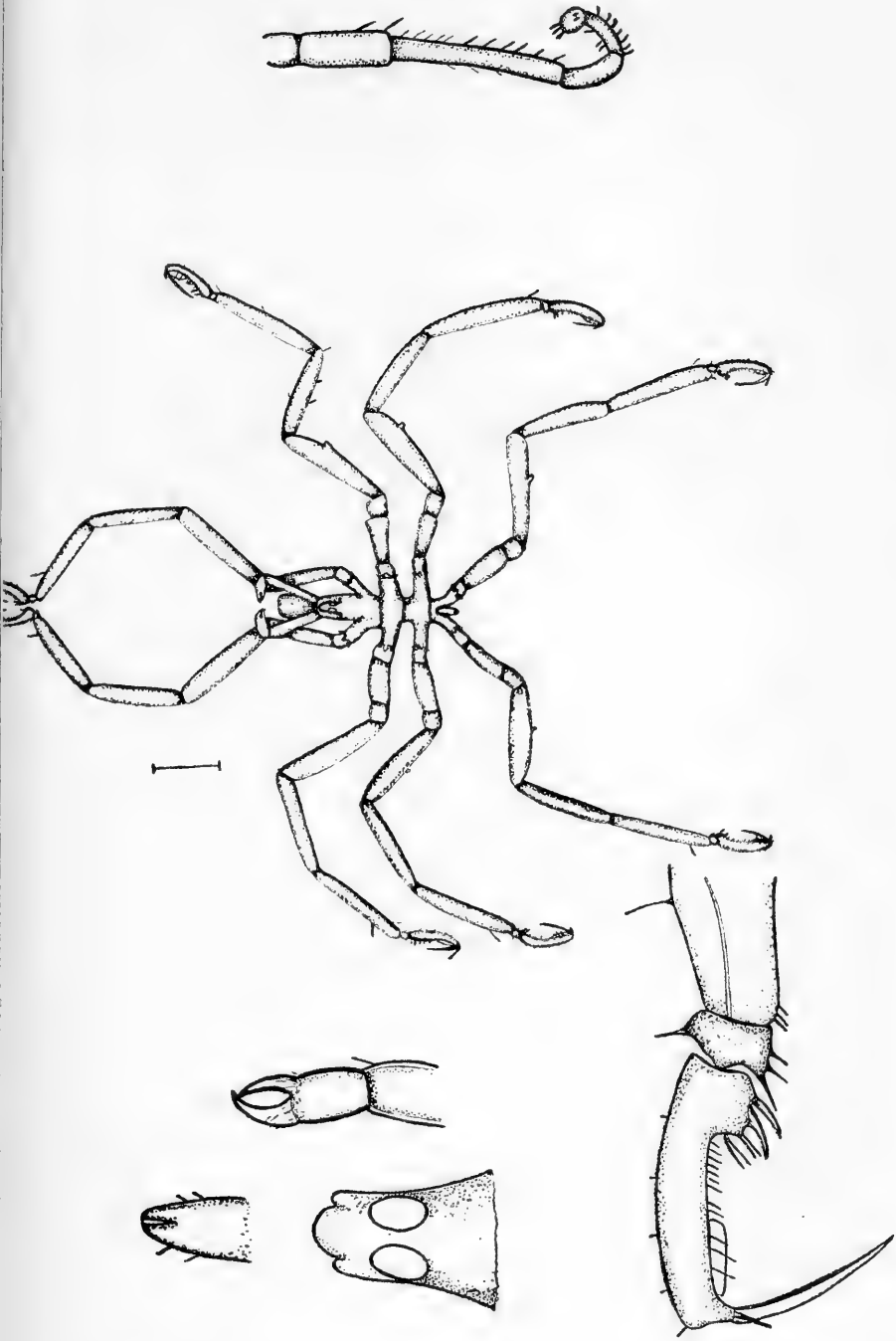
Scale at left equals 1 mm. Cheliforus, terminal leg joints, and oviger at different magnifications.



## PLATE 37

*Anoplodactylus erectus* Cole.

Scale at the left 1 mm. Tip of abdomen, ocular tubercle, cheliforus, tip of a leg, tip of oviger at different magnifications.

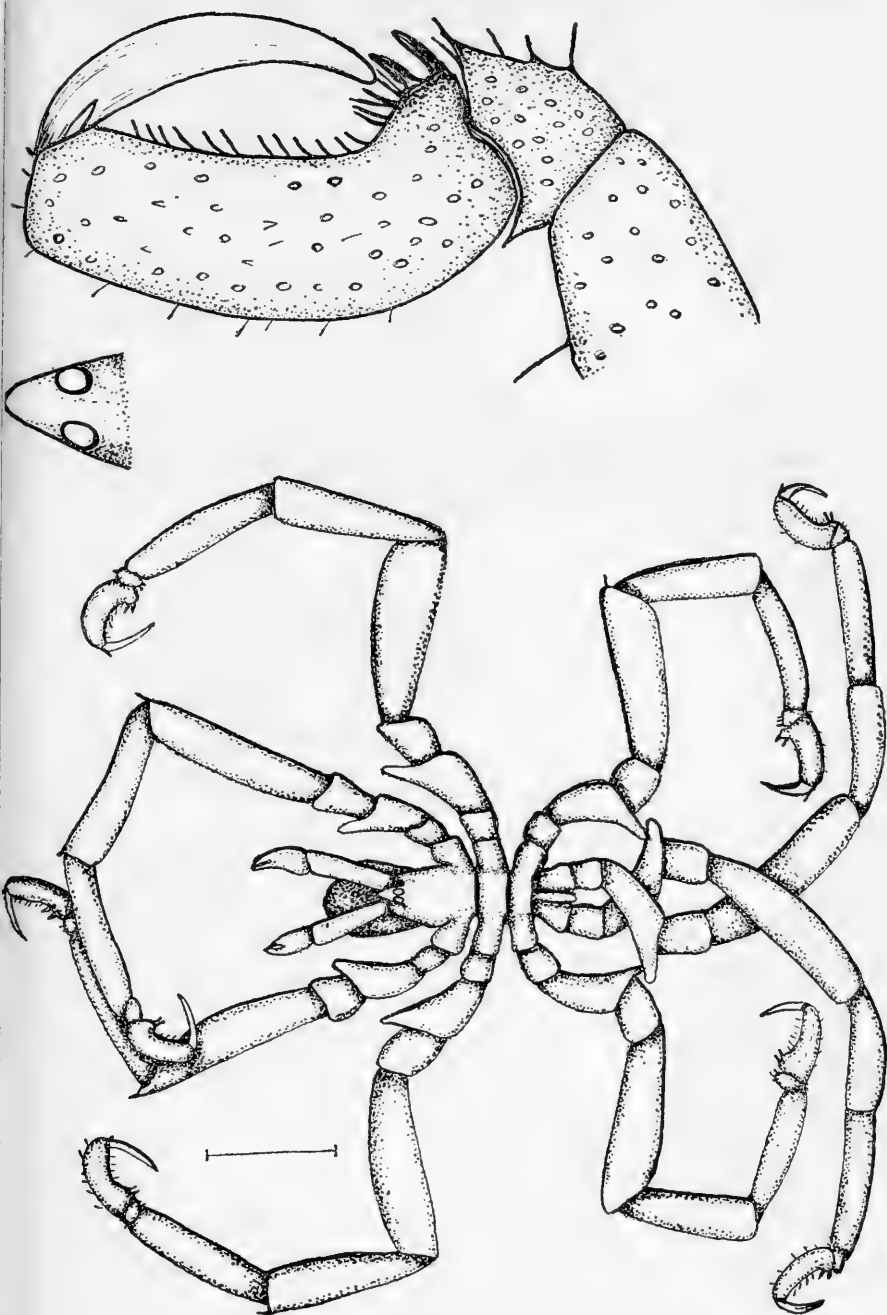


## PLATE 38

*Anoplodactylus californicus* Hall.

Scale 1 mm. Ocular tubercle, terminal leg joints at different magnifications.

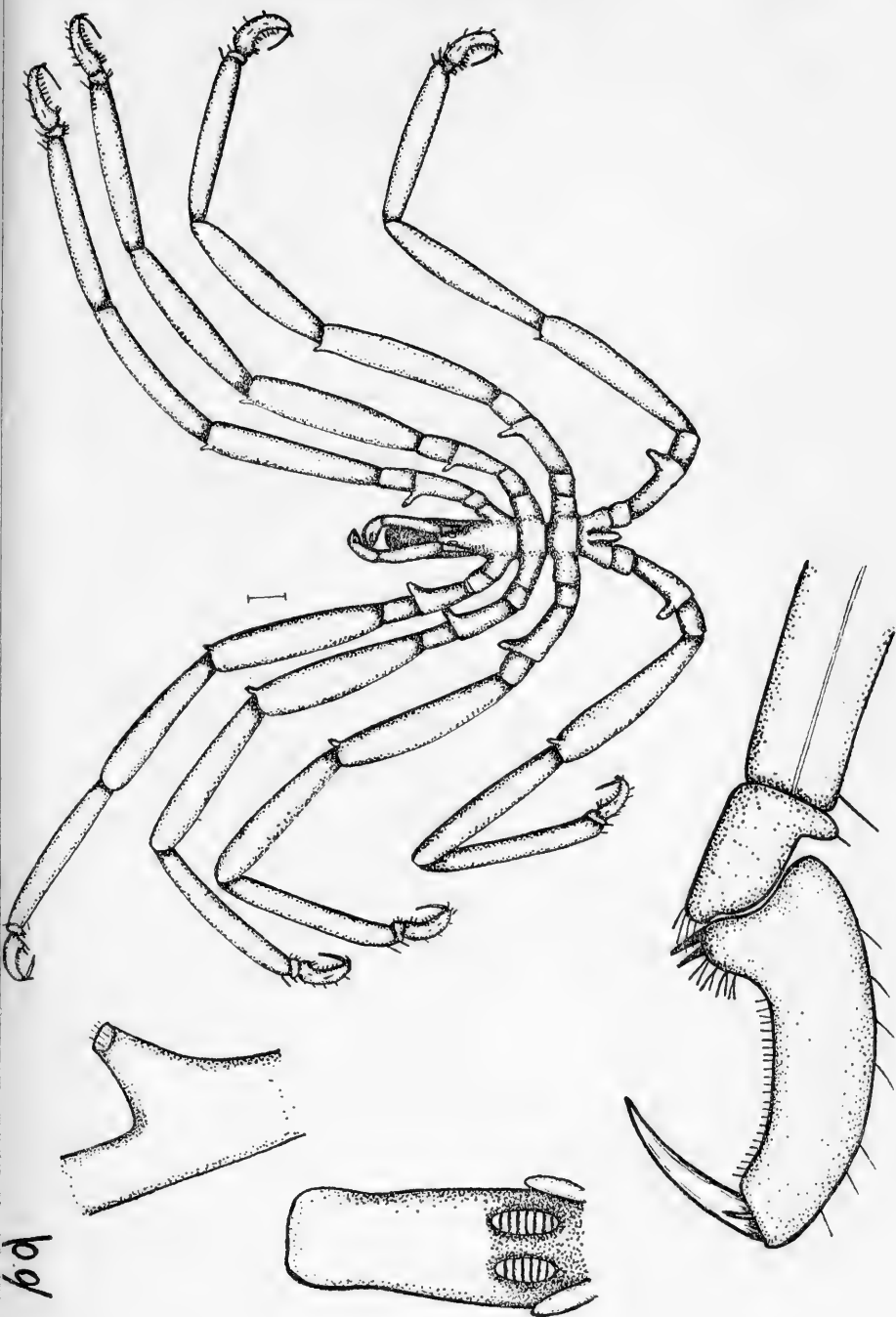




## PLATE 39

*Anoplodactylus robustus* Hilton.

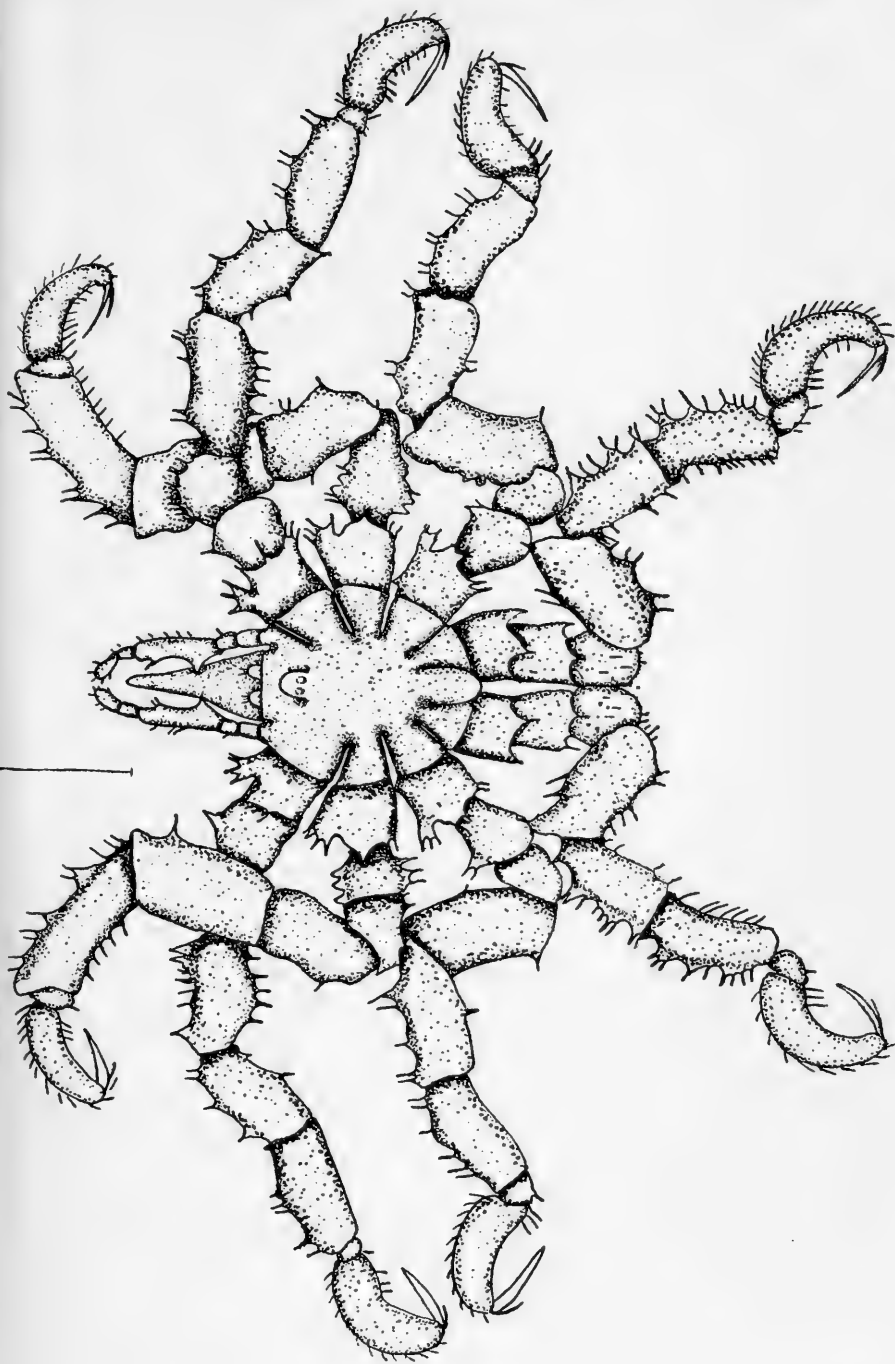
Scale 1 mm. for the body alone. Ocular tubercle, gland opening, attachment discs under the proboscis, and terminal leg joints at different magnifications.



## PLATE 40

*Tanystylum californicum* Hilton.

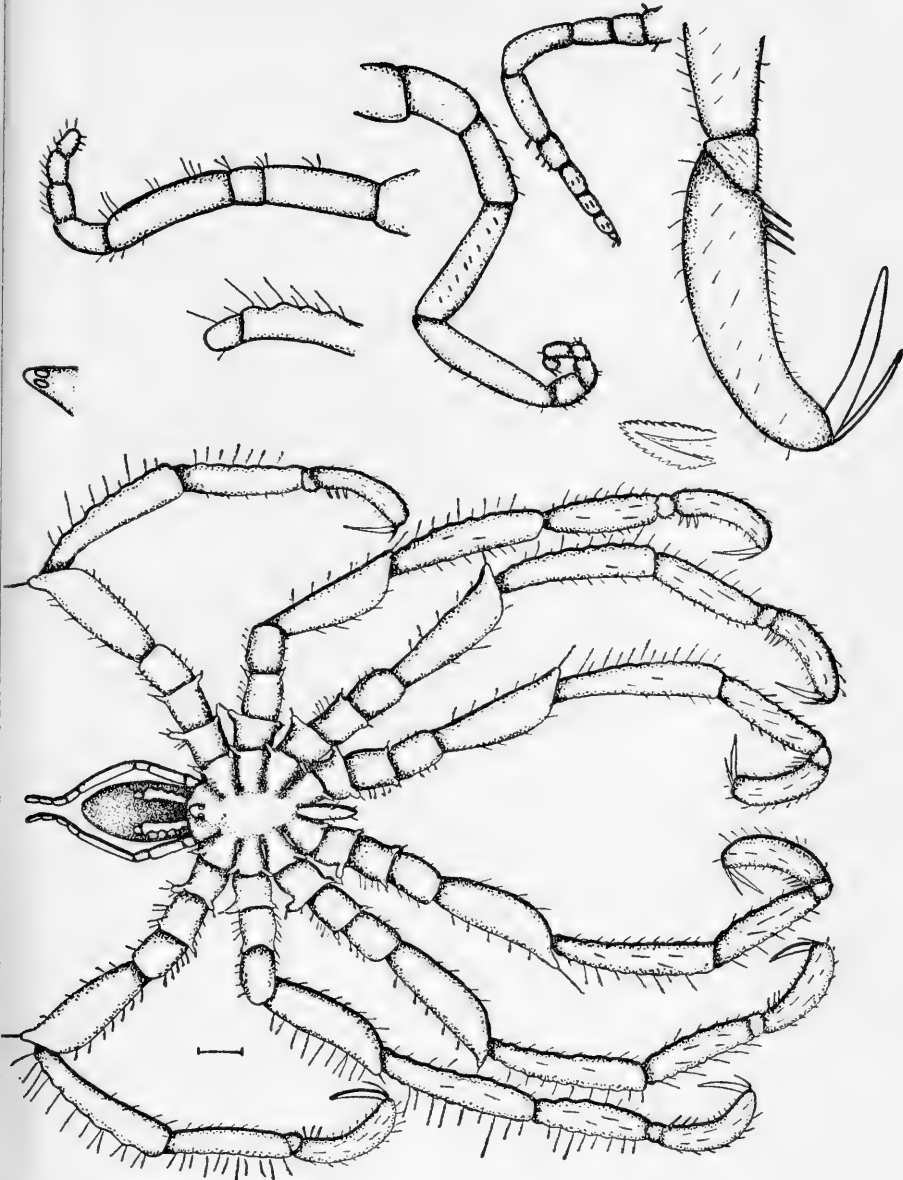
Scale equals 1 mm.



## PLATE 41

*Ammothea latifrons* Cole.

Scale 1 mm. for the body alone. Ocular tubercle, palpus, cheliforus, oviger of male above, female oviger below, terminal leg joints, spine.

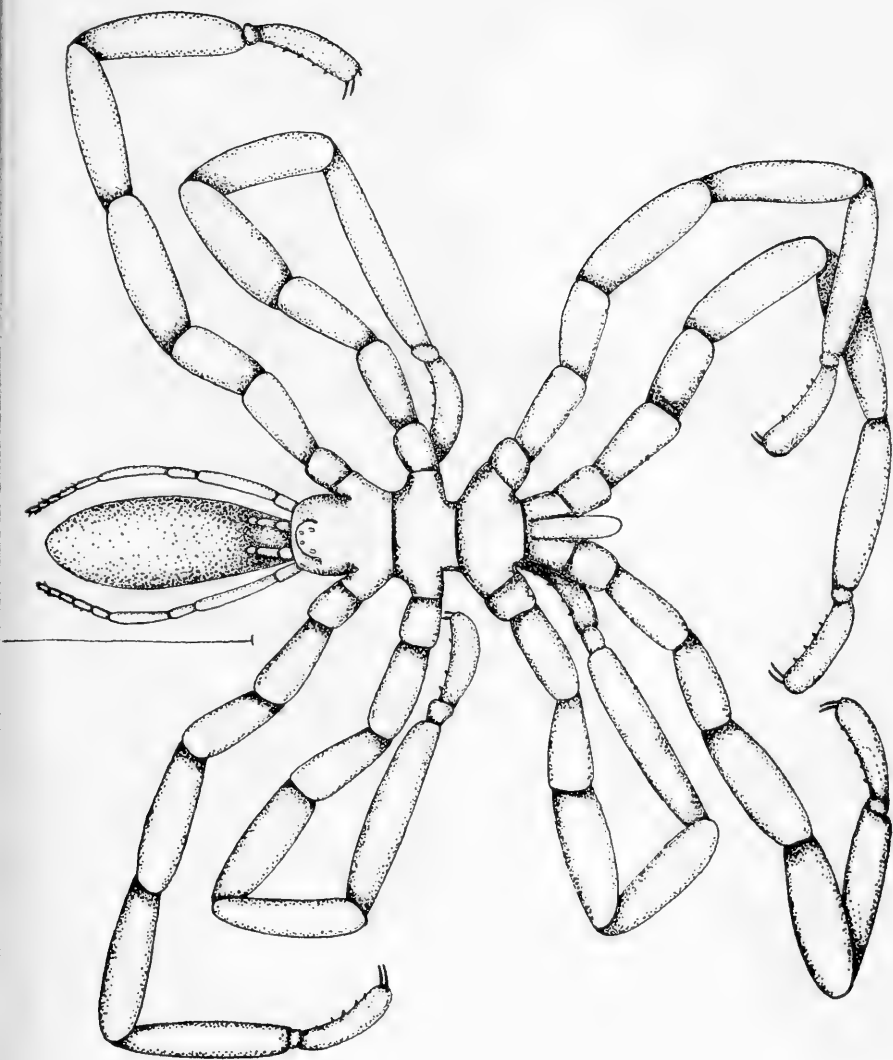


## PLATE 42

*Ammothella bi-unguiculata* (Dohrn).

Scale equals 1 mm.

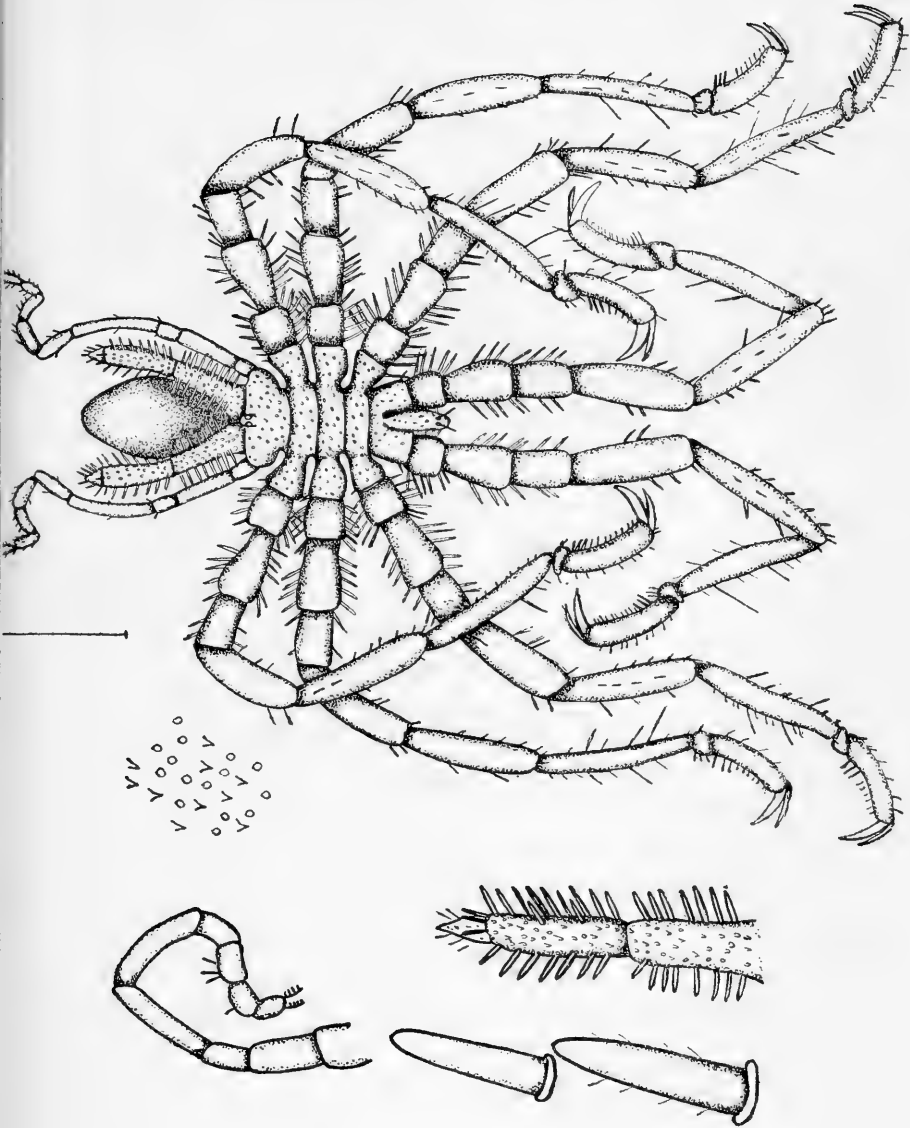




## PLATE 43

*Ammothella heterosetosa*, new species.

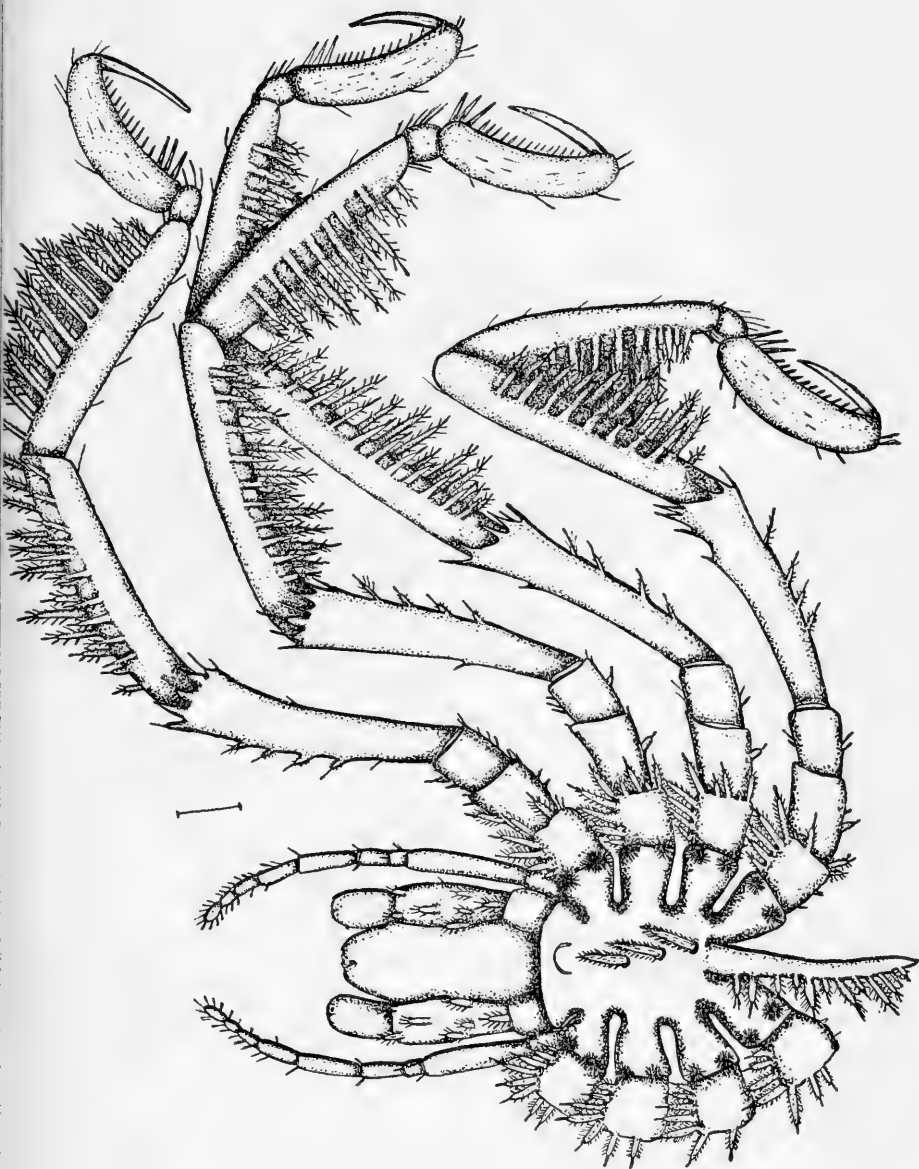
Scale at left 1 mm. Small figures at other magnifications. Oviger, surface of the body, individual cylindrical hairs. Cheliforus.



## PLATE 44

*Nymphopsis spinosissima* (Hall).

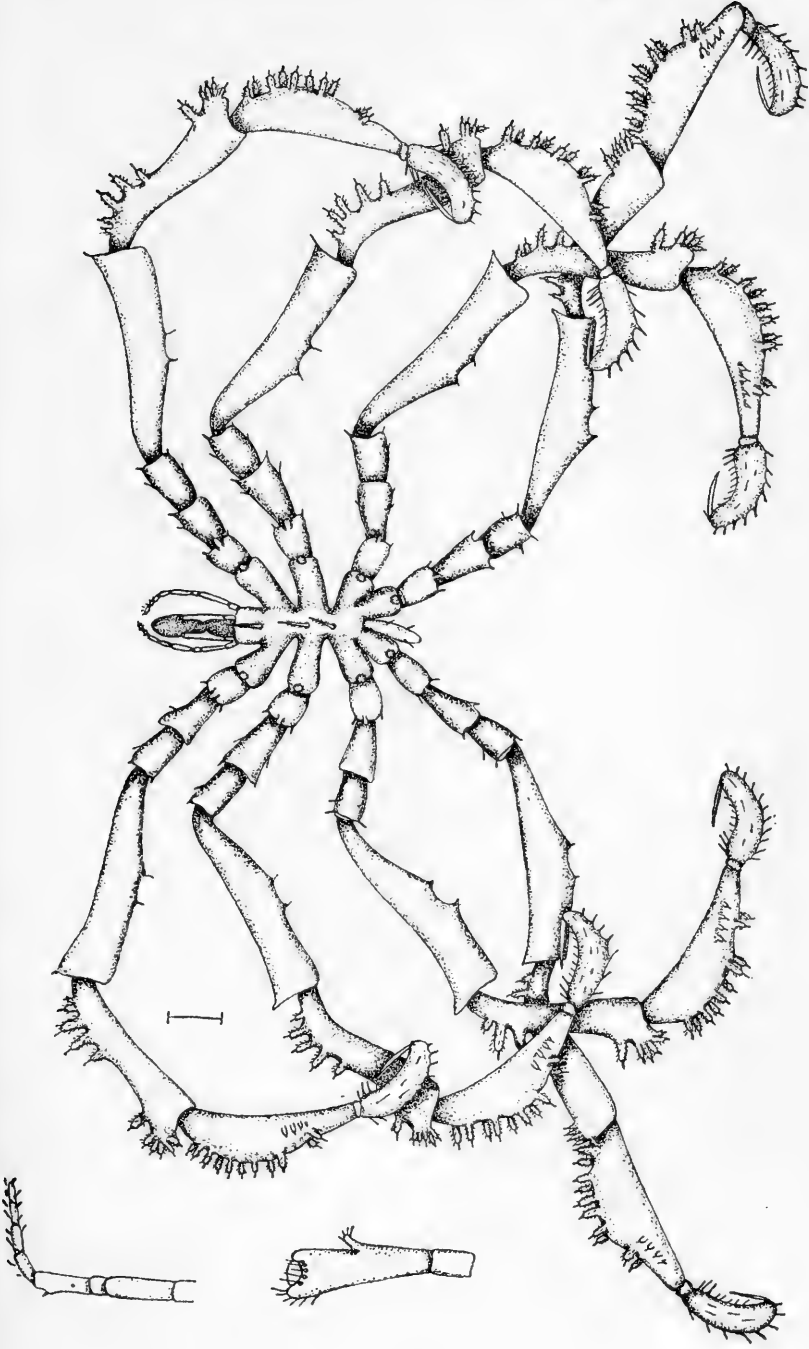
Scale equals 1 mm.



## PLATE 45

*Nymphopsis duodorsospinosa*, female. Hilton.

Scale equals 1 mm. for body alone. Palpus and cheliforus different scale.

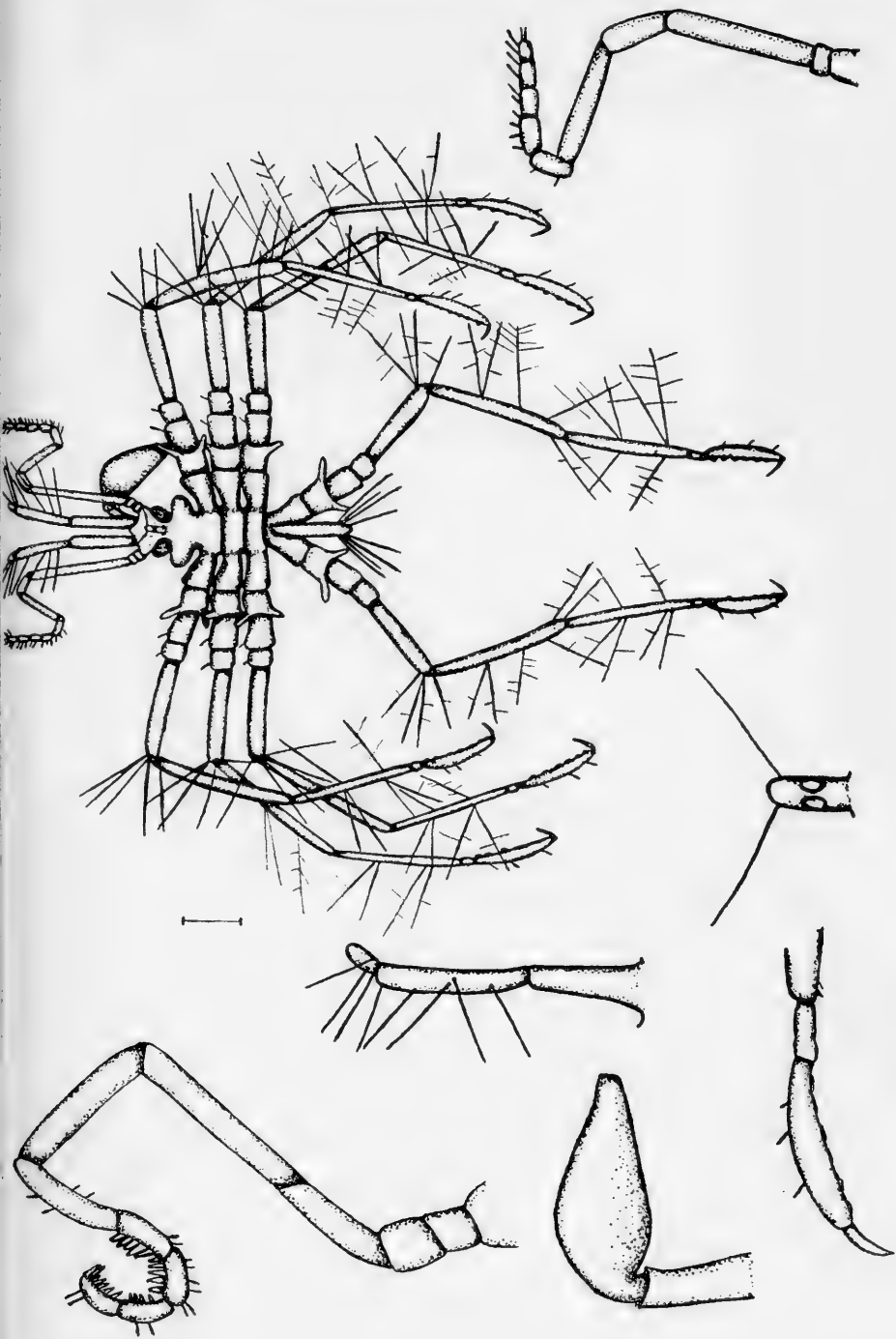


## PLATE 46

*Eurycyde longisetosa*, new species.

Scale 1 mm.

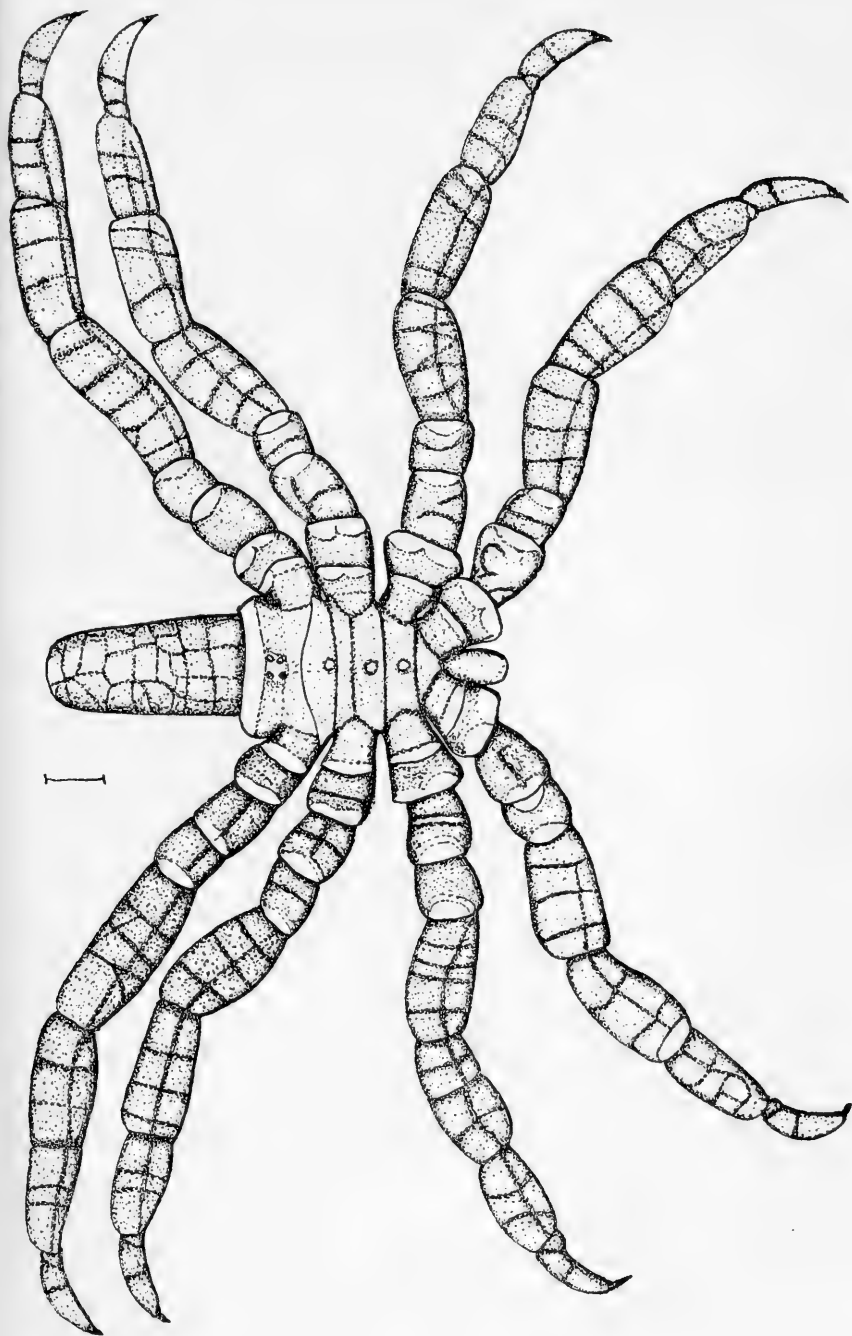




## PLATE 47

*Pycnogonum hancocki* Schmitt.

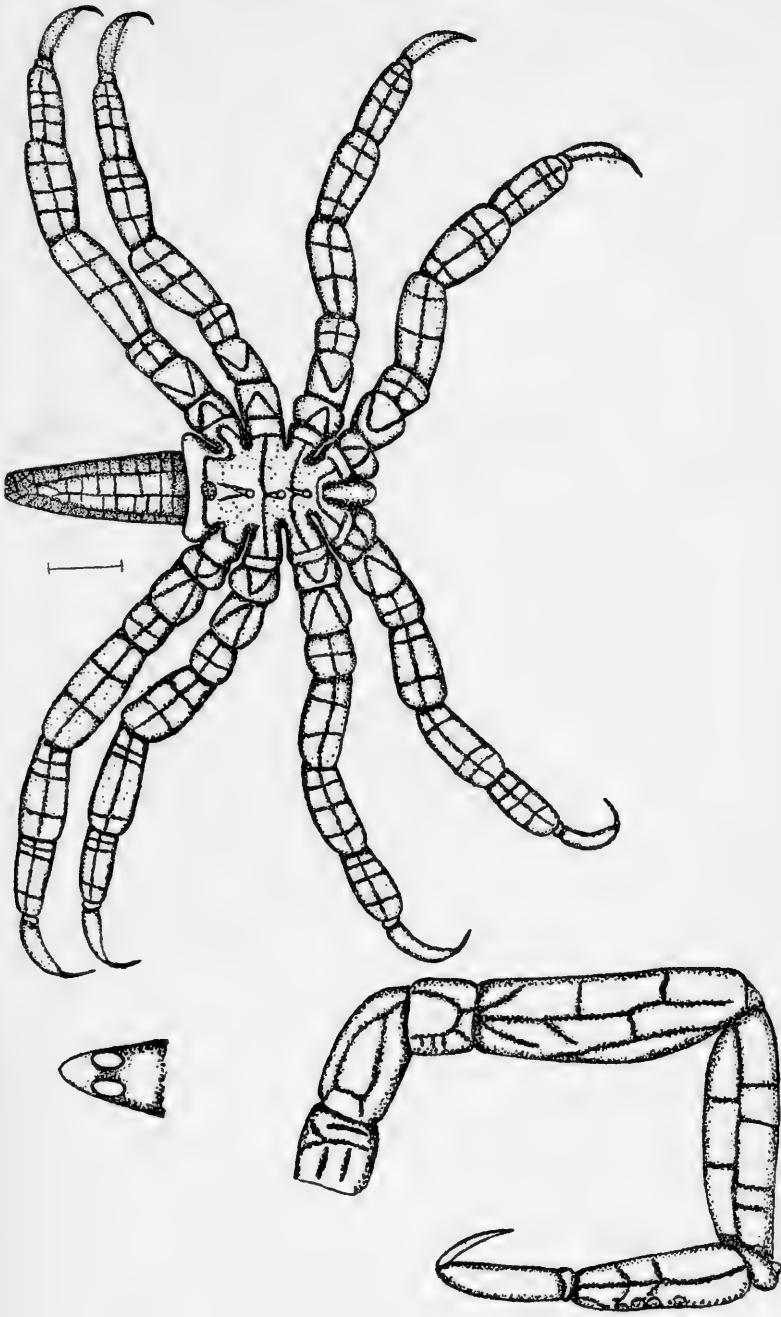
Scale equals 1 mm.



## PLATE 48

*Pycnogonum panamum*, new species.

Scale equals 1 mm. Ocular eye elevation and one leg enlarged at different scales.





REPORTS ON THE COLLECTIONS OBTAINED BY ALLAN HANCOCK PACIFIC EXPEDITIONS OF  
VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA,  
AND GALAPAGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935,  
IN 1936, IN 1937, IN 1938, IN 1939, AND IN 1940.

## LITTORAL BRACHYURAN FAUNA OF THE GALAPAGOS ARCHIPELAGO

(PLATES 49-87; 1 TEXT FIGURE)

*By* JOHN S. GARTH



THE UNIVERSITY OF SOUTHERN CALIFORNIA PUBLICATIONS  
ALLAN HANCOCK PACIFIC EXPEDITIONS  
VOLUME 5, NUMBER 10  
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# LITTORAL BRACHYURAN FAUNA OF THE GALAPAGOS ARCHIPELAGO

(Plates 49-87; 1 Text Figure)

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## INTRODUCTORY REMARKS

The present study is essentially a report on the brachyuran Crustacea obtained in the Galapagos Islands by the Allan Hancock Expeditions of 1932, 33, 34, 35, and 1938. However, *Velero III* collections were found to represent so large a proportion of the known insular fauna that the scope of the work has been expanded to include references to the remainder, albeit without descriptions or figures which would have had to be duplicated from other sources.

It was thought that by publishing several short papers containing descriptions of new species as rapidly as discovered the work could be kept current and tedious descriptive material could be avoided at this writing. However, it has been found necessary in the interest of taxonomic clarity to designate as new one species in addition to those included in Rathbun (1933, 1935), Garth (1939), and Glassell (1940). Supplementary descriptions are given of two species previously known from one sex only and of one species heretofore represented solely by immature specimens. Several species known previously from unique types are listed in numbers and from several localities within the islands. A total of 44 species, 32 genera, and 5 families of Brachyura are recorded for the first time from the Galapagos area. New information on range, habitat, depth, variation, and relationship is presented concerning the 102 species, 77 genera, and 15 families represented among the nearly 15,000 specimens obtained by *Velero III* collectors, which with the 18 species of 10 genera not encountered by Hancock Expeditions increases the known Galapagos brachyuran fauna to 120 species, 87 genera, and 15 families.

Excluded from the present paper and from the above compilation are larval forms and species which, because of the depths at which they were taken, belong in the abyssal rather than in the littoral benthos. The latter include *Rochinia cornuta* (Rathbun), *R. vesicularis* (Rathbun), and *R.*

*occidentalis* (Faxon), dredged in over 300 fathoms; *Trachycarcinus corallinus* Faxon, dredged in over 600 fathoms; and *Ethusina gracilipes* Miers, dredged in over 800 fathoms, all by the *Albatross* (Rathbun, 1898, 1907; Faxon, 1893, 1895).

It is intended that the study be used in connection with the Rathbun monographs (Grapsoid, 1918; Spider, 1925; Cancroid, 1930; and Oxy-stome, 1937), to which it is assumed each worker will take recourse for full descriptions of families, genera, and previously known species. However, the introduction of two genera new to the Americas in the writer's *New Brachyuran Crabs from the Galapagos Islands* (1939) calls for the inclusion of their descriptions, which occur in scattered or generally unavailable publications rather than in the above accessible works. Simplified keys to species, sufficient only to distinguish known Galapagos congeners one from another, are introduced whenever two or more species of a genus are represented in the insular fauna. Keys to genera are not given, since they would be nearly as extensive as the Rathbun keys and should, in the opinion of the writer, be reserved for similar monographic reports.

References to literature have of necessity been limited to the original description, the first use of the name in its current combination, and the citation placing the organism in the Galapagos fauna, if not included in the above two. In cases of involved synonymy, the reader is referred to the appropriate Rathbun monograph; citations of the occurrence of the species in the Eastern Pacific subsequent to the publication dates of the respective monographs are, however, given in full.

The inconvenience experienced by *Velero III* workers in attempting to use lengthy descriptions under field conditions has resulted in the substitution of brief diagnoses of the outstanding characters of each species as observable without microscopic examination. These, with the aid of the keys and illustrations given, should enable the field collector to identify his specimens quickly and accurately, a task in which he will be greatly assisted by Mr. Anker Petersen's notes on living specimens based on Ridgway, *Color Standards and Color Nomenclature* (1912).

Since the publication in the Rathbun monograph (1937) of the oxy-stomatous and allied crabs taken on the Hancock Expeditions of 1933-34, approximately one half of the specimens so recorded have been returned by the U. S. National Museum to the Allan Hancock Foundation, and it has been possible to list such specimens herein, as well as to enumerate for the first time the oxystomes obtained on the 1935 and 1938 cruises. Subsequent to the publication of this paper a similar division of the non-oxystomatous crabs will be worked out, approximately one half of the specimens of each species to be returned by the Allan Hancock Foundation

to the U. S. National Museum. For this reason it has not been possible to assign permanent catalogue numbers to the collection beyond the Oxystomata.

The major problem in any Galapagos brachyuran fauna is how best to treat the 17 species collected by Cuming *circa* 1829 and reported upon by Bell (1835-36) with types attributed to the Galapagos Islands. Few of these have been collected there since, while practically all of them have been turned up along the mainland coast of South America from Santa Elena Bay, Ecuador, to the Bay of Panama, localities also visited by Cuming. Ten of the 18 species herein recorded as occurring in Galapagos waters but as not having been obtained there by Allan Hancock Expeditions are Bell species which have not been found in the islands by any collector subsequent to Cuming, if indeed he found them there. Eight of the 10, however, have been obtained by *Velero III* collectors at mainland or other insular stations. Since the writer's unpublished distributional studies have shown that mainland species, whether Peruvian, Panamanian, or Gulf of Californian, may occur sporadically in the Galapagos Islands, it cannot be stated categorically that the 10 Bell species were not collected in the archipelago, or that they may not be found there again. For this reason they are included in the fauna, with emphasis upon the fact that they have not been taken in Galapagos waters for 115 years.

The same situation does not obtain in the case of the Miers and Milne Edwards species, *Leptodius cooksoni* and *Eriphia granulosa*, or Mier's Chilean records of Bell's species, *Mithrax (Mithrax) bellii* Gerstaecker (name substituted for *Mithrax ursus* Bell) and *Mithrax (Mithraculus) nodosus*. Here it is the early mainland record which lacks recent specimen authentication, the species in question being otherwise Galapagos endemics.

Six new species, one species not previously illustrated, one species not recognizable from the existing illustration, one species known only from the young, the adult of which is represented for the first time, and two species known only from the female, the males of which are represented for the first time, are illustrated in pen and ink drawings by Mr. Anker Petersen, staff artist, Allan Hancock Foundation. The remaining species obtained by Hancock or other recent expeditions in the Galapagos are illustrated photographically. It has not been thought best, however, to draw upon Hancock collections from the mainland for illustrations of Galapagos species not obtained in the islands, since photographs of these will undoubtedly be included in forthcoming accounts of collecting on continental shores.

The writer wishes to acknowledge his indebtedness to Captain Allan Hancock, master of the *Velero III* and director of the expeditions, for

the opportunity of visiting the Galapagos Islands and of studying the collections, to Dr. Waldo L. Schmitt, former curator of marine invertebrates, U. S. National Museum, for assistance both in the field and in the laboratory, to the late Dr. Mary J. Rathbun, associate in zoology, U. S. National Museum, for assistance in the early stages of the work, to Dr. Isabella Gordon of the British Museum, Dr. Fenner A. Chace of the Harvard Museum of Comparative Zoology, and Miss Jocelyn Crane of the New York Zoological Society for comparison of specimens with types not easily accessible to the writer and for the loan of valuable specimens, to Mr. Steve A. Glassell, research associate, San Diego Society of Natural History, for the loan of rare publications, and to Messrs. Fred C. Ziesenhenné, Granville P. Ashcraft, and Anker Petersen, staff members of the Allan Hancock Foundation, for help in collecting, cataloguing, and color noting, respectively, the multitude of individual specimens.

Tribe BRACHYURA

Subtribe GYMNOPLEURA

Family *RANINIDAE*

Genus *RANINOIDES* Milne Edwards, 1837

*Raninoides ecuadorensis* Rathbun

Plate 49, Figs. 1-5

*Raninoides ecuadorensis* Rathbun, Proc. Biol. Soc. Washington, vol. 48, p. 1, 1935; Bull. 166, U.S. Nat. Mus., p. 15, pl. 80, figs. 5-7, 1937.

*Type locality*.—La Plata Island, Ecuador.

*Type*.—USNM No. 69319.

*Range*.—Previously known only from the type locality. Unpublished data on the Hancock collections in the possession of the writer show it to be an abundant member of the Gulf of California fauna.

*Diagnosis*.—Carapace barrel shaped, anterior portion roughened. Outer orbital tooth almost as advanced as outer rostral tooth. Three long spines on lower border of manus. Dactyls of legs 1-3 crescentic, of leg 4 suboval.

*Material examined*.—

795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 1 female (AHF no. 38001).

*Measurements*.—Male from the type series: length 20.1 mm, width 11.6 mm.

*Color in life*.—Ground color of carapace yellowish deep olive buff, entirely overcast with red, giving the appearance of light yellow orange.



Chelipeds and ambulatory legs lightly touched with red, appearing much lighter in color than the carapace. Eyes dark brown. Ventral side white. (Petersen) (Notes made from a Gulf of California specimen.)

*Habitat*.—Sand.

*Depth*.—35-55 fms.

*Remarks*.—Since this species was not taken by the earlier Allan Hancock Expeditions in the Galapagos Islands, it is not recorded in Rathbun (1937) as a member of the Galapagos fauna. The single female from Sullivan Bay, James Island, has been compared with the type series from La Plata Island, Ecuador, also dredged by *Velero III* collectors, and agrees in every particular.

*R. ecuadorensis* is now recorded from the Galapagos Islands. The specimen illustrated is, however, a paratype from La Plata Island, Ecuador.

Genus **RANILIA** Milne Edwards, 1837

**Ranilia fornicata** (Faxon)

Plate 60, Figs. 1, 2

*Raninops fornicata* Faxon, Bull. Mus. Comp. Zool., vol. 24, p. 162, 1893; Mem. Mus. Comp. Zool., vol. 18, p. 41, pl. 7, figs. 1, 1a, and 1b, 1895.

*Ranilia fornicata* Milne Edwards and Bouvier, Mem. Mus. Comp. Zool., vol. 47, p. 302, 1923. Rathbun, Bull. 166, U.S. Nat. Mus., p. 20, pl. 5, figs. 3 and 4, 1937.

*Type locality*.—Albatross station 3369.

*Type*.—MCZ No. 4506.

*Range*.—From Magdalena Bay, Lower California (Glassell), to La Plata Island, Ecuador (*Velero III*); Galapagos (*Velero III*).

*Atlantic analogue*.—*R. constricta* (A. Milne Edwards).

*Diagnosis*.—Carapace subcylindrical, punctate, narrowing abruptly forward of lateral angle. Rostral spine exceeding outer orbital. A terminal spine on merus and carpus of cheliped. Inner border of dactyl of leg 3 convex.

*Material examined* (24 specimens from 10 stations).—

147-34. Tagus Cove, Albemarle Island, 30 fms, Jan. 13, 1934, 1 male (USNM No. 69198).

183-34. James Bay, James Island, 50-70 fms, Jan. 24, 1934, 1 male (USNM No. 69341).

190-34. Lat. 0° 55' S, Long. 90° 30' W, 58-60 fms, Jan. 26, 1934, 2 females (USNM No. 69201).

191-34. Lat. 0° 55' S, Long. 90° 30' W, 70 fms, Jan. 26, 1934, 3 females (USNM No. 69200), 2 females (AHF no. 34001).

195-34. North of Charles Island, 70-80 fms, Jan. 29, 1934, 1 female (AHF no. 34002).

325-35. Off Tagus Cove, Albemarle Island, 80 fms, Dec. 10, 1934, 1 male (AHF no. 35001).

327-35. Tagus Cove, Albemarle Island, 12 fms, Dec. 10, 1934, 1 male, 2 females (AHF no. 35002).

792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 1 female (AHF no. 38002).

814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 1 male (photographed), 5 females, 2 fragments (AHF no. 38003).

816-38. North of Hood Island, 50-100 fms, Jan. 29, 1938, 1 male, 2 females (AHF no. 38004).

*Measurements*.—Largest specimen, male: length 12.6 mm, width 8.7 mm.

*Color in life*.—Ground color of carapace white, overcast with small patterns of various shades of pale dull yellow and striated with pale ochraceous orange. Eyestalks white, banded with ochraceous orange; eye apple green. Cheliped white with large spot of ochraceous orange at distal end of merus. Hand ochraceous orange, brighter on upper surface, fading on under side. First two ambulatory legs clear white, third and fourth with ochraceous orange along under side to dactyl, which is clear white. Ventral side clear white. (Petersen)

*Habitat*.—Sand, sand and mud, sand and nullipore; rock and sand; coral, nullipore, and rock.

*Depth*.—7-100 fms.

*Remarks*.—Judging from the number of Galapagos stations at which *R. fornicata* was taken, it, rather than the preceding *Raninoides ecuadorensis* Rathbun, is the abundant member of the family Raninidae in the archipelago. An excellent series of motion pictures, showing the manner in which this species buries itself in sand, is in the photographic library of the Allan Hancock Foundation.

The family Raninidae had not been recorded in the Galapagos Islands prior to the work of *Velero III* collectors.

Subtribe DROMIACEA

Family **DROMIIDAE**

Genus **DROMIDIA** Stimpson, 1858

**Dromidia larraburei** Rathbun

Plate 61, Figs. 1, 2

*Dromidia sarraburei* (by error) Rathbun, Proc. U.S. Nat. Mus., vol. 38, p. 553, pl. 48, fig. 4, 1910.

*Dromidia larraburei* Schmitt, Univ. California Publ. Zool., vol. 23, p. 183, pl. 33, fig. 1, 1921. Boone, Zoologica, vol. 8, no. 4, p. 285, fig. 102a, b, c, and d, 1927. Rathbun, Bull. 166, U.S. Nat. Mus., p. 35, pl. 7, figs. 4 and 5, text fig. 13, and synonymy, 1937. Crane, Zoologica, vol. 22, no. 7, p. 106, 1937.

*Type locality*.—Sechura Bay, Peru.

*Type*.—USNM No. 40475.

*Range*.—Monterey Bay, California (Weymouth), to Sechura Bay, Peru; Galapagos Islands (*Arcturus*).

*Atlantic analogue*.—*D. antillensis* Stimpson.

*Diagnosis*.—Carapace convex, hairy, broader than long. Frontal and marginal teeth stout and blunt. A well-marked branchial groove, behind it an acute tooth. Palm studded with rounded tubercles. Carries a sponge cover.

*Material examined* (32 specimens from 22 stations).—

147-34. Tagus Cove, Albemarle Island, 30 fms, Jan. 13, 1934, 1 young (AHF no. 34003).

148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 1 young (AHF no. 34004).

149-34. Tagus Cove, Albemarle Island, 20 fms, Jan. 13, 1934, 1 male, 1 female (AHF no. 34005).

152-34. Tagus Cove, Albemarle Island, coral, Jan. 14, 1934, 1 male, 1 ovig. female, 1 young (USNM No. 69240).

154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 1 male (USNM No. 70769).

155-34. Off Tagus Cove, Albemarle Island, 50-60 fms, Jan. 15, 1934, 1 young (AHF no. 34006).

157-34. Tagus Cove, Albemarle Island, 10-18 fms, Jan. 15, 1934, 2 males (USNM No. 69620), 1 male, 1 soft shell (AHF no. 34007).

167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 1 male (USNM No. 70771).

169-34. Academy Bay, Indefatigable Island, 15-25 fms, Jan. 20, 1934, 1 female (AHF no. 34008).

177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 1 young (AHF no. 34009).

182-34. James Bay, James Island, 30 fms, Jan. 24, 1934, 1 young (USNM No. 69337).

183-34. James Bay, James Island, 50-70 fms, Jan. 24, 1934, 1 young (AHF no. 34010).

189-34. Cartago Bay, Albemarle Island, coral, Jan. 25, 1934, 1 ovig. female (AHF no. 34011).

- 197-34. Off Post Office Bay, Charles Island, 35-40 fms, Jan. 31, 1934, 1 female, 1 young (AHF no. 34012).  
204-34. Gardner Bay, Hood Island, 30 fms, Jan. 31, 1934, 1 female (USNM No. 69242).  
322-35. Tagus Cove, Albemarle Island, 10 fms, Dec. 10, 1934, 1 male, 1 young (AHF no. 35003).  
326-35. Tagus Cove, Albemarle Island, 15 fms, Dec. 10, 1934, 1 young (USNM).  
327-35. Tagus Cove, Albemarle Island, 12 fms, Dec. 10, 1934, 1 male (AHF no. 35004).  
346-35. Between South Seymour and Daphne Islands, 55 fms, Dec. 13, 1934, 1 soft shell (AHF no. 35005).  
795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 2 males, 1 female (AHF no. 38005).  
796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 1 male (AHF no. 38006).  
800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 1 female (photographed), (AHF no. 38007).

*Measurements.*—Largest specimen, ovigerous female: length 21.8 mm, width 22.6 mm. This is one of the largest specimens of the species in Hancock collections.

*Habitat.*—A variety of bottoms, including sand and shell, coral, mulipore, and rock. *D. larraburei* was encountered also in shore collecting and even in *Pocillopora* coral.

*Depth.*—Shore to 60 fms.

*Remarks.*—*D. larraburei* is one of the few Galapagos brachyuran species occurring as far north as California waters. Rathbun (1937) records a specimen taken at Long Beach by H. N. Lowe, in territory familiar to the writer, as well as the Weymouth specimen from Monterey Bay. This dromid crab slips into and out of his sponge "house" with great facility.

### Genus **HYPOCONCHA** Guérin, 1854

#### **Hypoconcha panamensis** Smith

Plate 61, Figs. 3, 4

*Hypoconcha panamensis* Smith, in Verrill, Amer. Nat., vol. 3, p. 249, 1869. Rathbun, Bull. 166, U.S. Nat. Mus., p. 47, pl. 9, figs. 6 and 7, and synonymy, 1937.

*Type locality.*—Panama.

*Type.*—In Peabody Mus., Yale.

*Range*.—From Angeles Bay, Gulf of California (Glassell), to Matalpalo, Peru (Coker); Galapagos Islands (*Albatross*).

*Atlantic analogue*.—*H. arcuata* Stimpson.

*Diagnosis*.—Frontal and lateral margins expanded in a broad arc concealing eyes and antennules. Cardiac area paper thin. A distinct lobe at widest part of dorsum. Manus with 3 granulate tubercles near fingers. Last two pairs of legs prehensile.

*Material examined* (11 specimens from 7 stations).—

55-33. Lat.  $1^{\circ} 03' 30''$  S, Long.  $90^{\circ} 17' 30''$  W, 60 fms, Feb. 5, 1933, 1 female (USNM No. 68260).

147-34. Tagus Cove, Albemarle Island, 30 fms, Jan. 13, 1934, 1 female (USNM No. 69340), 2 males, 1 young (AHF no. 34013).

182-34. James Bay, James Island, 30 fms, Jan. 24, 1934, 1 female (USNM No. 69338).

190-34. Lat.  $0^{\circ} 55'$  S, Long.  $90^{\circ} 30'$  W, 58-60 fms, Jan. 26, 1934, 1 young (USNM No. 69251), 1 young (AHF no. 34014).

200-34. Off Black Beach, Charles Island, 25-40 fms, Jan. 30, 1934, 1 male (USNM No. 69245).

810-38. (D-2) Barrington Island, 73 fms, Jan. 26, 1938, 1 male (photographed) (AHF no. 38008).

816-38. North of Hood Island, 50-100 fms, Jan. 29, 1938, 1 male (AHF no. 38009).

*Measurements*.—Largest specimen, female: length 33.5 mm, width 36.0 mm.

*Habitat*.—Sand, sand and nullipore; coral, nullipore, and rock.

*Depth*.—3-100 fms.

*Remarks*.—Unlike the preceding species, *Dromidia larraburei* Rathbun, *H. panamensis* carries a shell "house" instead of a sponge. The shells selected are not always of the same species, but are always the single valve of a bivalve shell, pectens and clams being favorites. In this way they differ from the hermit crabs of the tribe Anomura, which invariably select a univalve, or gastropod, shell for their temporary abode.

## Family *DYNOMENIDAE*

Genus *DYNOMENE* Latreille, 1825

*Dynomene ursula* Stimpson

Plate 61, Figs. 5, 6

*Dynomene ursula* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 239 (111), 1860. Rathbun, Bull. 166, U.S. Nat. Mus., p. 54, pl. 12, figs. 1-4, 1937. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Type locality*.—Cape San Lucas, Lower California.

*Type*.—Not extant.

*Range*.—From Ensenada de los Muertos, Gulf of California (Glas-sell), to San Juan del Sur, Nicaragua (Lowe); Galapagos Islands (*Velero III*).

*Diagnosis*.—Carapace densely hairy, *Pilumnus*-like. Front triangular, notched at tip. Five anterolateral spines, excluding outer orbital. First 3 legs setose, nails black; legs of pair 4 reduced, dorsal in position.

*Material examined* (199 specimens from 35 stations).—

- 24-33. Gardner Bay, Hood Island, shore, Jan. 24, 1933, 1 female (AHF no. 33001).  
27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 2 females (AHF no. 33002).  
28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 1 female (AHF no. 33003).  
30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 2 males, 3 females (USNM No. 68313).  
33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 6 males, 2 females (USNM No. 68314).  
38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 3 males, 1 female (AHF no. 33004).  
48-33. Barrington Island, shore, Feb. 2, 1933, 1 female (USNM No. 68318).  
65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 1 male (USNM No. 68321).  
69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 12 males, 10 females (AHF no. 33005).  
71-33. James Bay, James Island, shore, Feb. 12, 1933, 1 male, 1 female (USNM No. 68323).  
73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 10 males, 14 females (3 ovig.) (AHF no. 33006).  
76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 8 males, 9 females (3 ovig.) (USNM No. 68316).  
94-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 1 male, 1 female (USNM No. 68324).  
97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 1 male (AHF no. 33007).  
148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 1 female, 4 young (AHF no. 34015).  
149-34. Tagus Cove, Albemarle Island, 20 fms, Jan. 13, 1934, 3 females (AHF no. 34016).

- 154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 3 females (AHF no. 34017).
- 166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 1 young female (AHF no. 34018).
- 167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 1 young (AHF no. 34019).
- 182-34. James Bay, James Island, 30 fms, Jan. 24, 1934, 1 young (AHF no. 34020).
- 183-34. James Bay, James Island, 50-70 fms, Jan. 24, 1934, 1 young (AHF no. 34021).
- 189-34. Cartago Bay, Albemarle Island, coral, Jan. 25, 1934, 1 young female (AHF no. 34022).
- 194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 1 female (AHF no. 34023).
- 199-34. Black Beach, Charles Island, shore, Jan. 30, 1934, 1 male (AHF no. 34024).
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 3 males (AHF no. 34025).
- 309-35. Marchena Island, 8 fms, Dec. 3, 1934, 1 young (AHF no. 35006).
- 311-35. Marchena Island, 20 fms, Dec. 3, 1934, 1 female (AHF no. 35007).
- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 1 female, 1 young (AHF no. 35008).
- 317-35. Opposite Gordon Rocks, Indefatigable Island, 25-30 fms, Dec. 8, 1934, 1 young (AHF no. 35009).
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 1 male, 3 females (1 ovig.), 1 young (AHF no. 35010).
- 344-35. Bartholomew Island near James Island, coral, Dec. 12, 1934, 4 females (AHF no. 35011).
- 784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 3 males, 2 females (AHF no. 38010).
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 4 females (2 ovig.) (AHF no. 38011).
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 28 males, (1 photographed), 24 females, 3 young (AHF no. 38012).
- 800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 4 males, 4 females (AHF no. 38013).

*Measurements.*—Largest specimen, male: length 18.5 mm, width 23.2 mm; female: length 14.0 mm, width 17.8 mm.

*Habitat*.—Rocky shore; occasionally in *Pocillopora* coral.

*Depth*.—Shore to 30 fms; rarely to 70 fms.

*Remarks*.—With no other Galapagos species of Brachyura is the field collector so likely to be misled as to identity as with *D. ursula*. Unless he notices that the fourth pair of walking legs are reduced to minute size and carried dorsally, he will believe himself to have found a species of *Pilumnus*. In the preliminary sorting of the Hancock Brachyura, all *Dynomene* were placed with the Xanthidae and retained by the writer instead of being placed with the oxystome crabs consigned to the National Museum, and they had to be sent for later in order to be included in the Rathbun monograph of 1937.

In view of the fact that *D. ursula* is one of the very few oxystomatous and allied crabs taken commonly in shore collecting, it is surprising that it had not been collected in the Galapagos Islands previous to the Hancock Expeditions, which found it to outnumber such common nonoxystomatous species as *Herbstia edwardsi* Bell and *Ozius perlatus* Stimpson.

Subtribe OXYSTOMATA  
Family **DORIPPIDAE**  
Genus **ETHUSA** Roux, 1828  
**Ethusa lata** Rathbun  
Plate 60, Fig. 3

*Ethusa lata* Rathbun, Proc. U.S. Nat. Mus., vol. 16, p. 258, 1893; Bull. 166, U.S. Nat. Mus., p. 84, pl. 24, fig. 1, pl. 25, fig. 1, pl. 28, fig. 3, text fig. 19, and synonymy, 1937. Crane, Zoologica, vol. 22, no. 7, p. 105, 1937.

*Type locality*.—Gulf of California, 33 fms.

*Type*.—USNM No. 17483.

*Range*.—From 20 miles south of San Roque Island, Lower California (Glassell), to La Plata Island, Ecuador (*Velero III*); Galapagos Islands (*Velero III*).

*Atlantic analogue*.—*E. microphthalmia* Smith.

*Diagnosis*.—First and second ambulatory legs stout, dactyls flattened, long as meri; last two pairs slight, dorsally placed, bearing hooked dactyli. Eyestalks very short, not extending beyond outer orbital spine. First 3 abdominal segments visible dorsally.

*Material examined* (13 specimens from 5 stations).—

147-34. Tagus Cove, Albemarle Island, 30 fms, Jan. 13, 1934, 1 young (USNM No. 69180).

201-34. Off Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 1 male (AHF no. 34026).



792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 6 young (AHF no. 38014).

814-38. North of Hood Island, 20-40 fms, Jan. 28, 1 male, 1 fragment (AHF no. 38015).

816-38. North of Hood Island, 50-100 fms, Jan. 29, 1938, 3 young (1 photographed) (AHF no. 38016).

*Measurements*.—Largest specimen, male: length 12.3 mm, width 12.0 mm, cheliped 17.0 mm, chela 7.3 mm, dactyl 4.0 mm.

*Habitat*.—Sand and shell, sand and mud; coral, nullipore, and rock.

*Depth*.—2-100 fms.

*Remarks*.—*E. lata* is another species which carries a protective armor dorsally. In this case it is neither a sponge, as with the *Dromidias*, nor a clam shell, as with the *Hypoconchas*, but a particle of a shell no bigger than the carapace, which leaves the long, slender legs protruding instead of tucked underneath, as in the other two.

With the exception of *Ethusina gracilipes* Miers, dredged by the *Albatross* in depths of from 885 to 1,360 fathoms, far below the limits of the littoral zone, no member of the family Dorippidae was known to inhabit Galapagos waters prior to the dredging operations of the *Velero III*.

Genus **CLYTHROCERUS** A. Milne Edwards and Bouvier, 1899

***Clythrocerus laminatus* Rathbun**

Plate 50, Figs. 1-7

*Clythrocerus laminatus* Rathbun, Proc. Biol. Soc. Washington, vol. 48, p. 2, 1935; Bull. 166, U.S. Nat. Mus., p. 115, pl. 80, figs. 1-4, 1937.

*Type locality*.—Wenman Island, Galapagos Islands, 100-150 fms.

*Type*.—USNM No. 69221.

*Range*.—Clarion Island, Mexico (*Velero III*); Galapagos Islands (*Velero III*).

*Diagnosis*.—Carapace wider than long. Frontal teeth broad, subacute; outer orbital tooth bluntly rounded. One lateral marginal tooth in front of widest part of carapace. Carpus of male bearing a large square plate on inner edge. Last two legs dorsal, prehensile; crab carries a bit of shell.

*Material examined* (48 specimens from 9 stations).—

143-34. Wenman Island, 100-150 fms, Jan. 11, 1934, 4 males, 2 females (USNM Nos. 69221 (the type), 69194, 69192, 69222, and 69193), 5 males, 2 females, 1 young (AHF no. 34027).

148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 1 young (AHF no. 34028).

- 170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 2 males (1 illustrated), 2 females (USNM No. 69185), 5 males (AHF no. 34029).
- 177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 1 young (AHF no. 34030).
- 185-34. Cartago Bay, Albemarle Island, 32 fms, Jan. 25, 1934, 3 males, 3 females (USNM No. 69187), 8 females (1 illustrated in part) (AHF no. 34031).
- 187-34. Cartago Bay, Albemarle Island, 8-10 fms, Jan. 25, 1934, 3 females (AHF no. 34032).
- 190-34. Lat.  $0^{\circ} 55' S$ , Long.  $90^{\circ} 30' W$ , 58-60 fms, Jan. 26, 1934, 1 male (AHF no. 34033).
- 201-34. Off Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 1 male, 3 females (AHF no. 34034).
- 323-35. Tagus Cove, Albemarle Island, 15 fms, Dec. 10, 1934, 1 female (AHF no. 35012).

*Measurements*.—Male: length 4.5 mm, width 5.0 mm; female: length 2.7 mm, width 3.3 mm.

*Habitat*.—Sand and rock, sand and coral, sand and nullipore; mud; coral, nullipore, and calcareous worm tubes.

*Depth*.—8-150 fms.

*Remarks*.—The range as given by Rathbun (1937), "Mexico to the Galapagos Islands," is very misleading, as it implies continuous distribution along the mainland shore. Actually, the only Mexican record is one of *Velero III* from Clarion Island, 600 miles off the Mexican coast. Obviously, we have here either a true Galapagos endemic species which has extended its range to Clarion Island, or a Clarion Island endemic species which has migrated to the Galapagos Islands. A parallel distribution is that of *Leptodius cooksoni* Miers. In neither case has the species established itself on continental shores.

No new records of the species were obtained on the Allan Hancock Expedition of 1938.

## Family *LEUCOSIIDAE*

### Subfamily *EBALIINAE*

#### Genus *EBALIA* Leach, 1817

#### *Ebalia hancocki* Rathbun

Plate 51, Figs. 1-6

*Ebalia hancocki* Rathbun, Proc. Biol. Soc. Washington, vol. 46, p. 183, 1933; Bull. 166, U.S. Nat. Mus., p. 128, pl. 36, figs. 6-8; pl. 82, figs. 1 and 2, 1937.

*Type locality*.—Charles Island, Galapagos Islands, 56 fms.

*Type*.—USNM No. 67988.

*Range*.—Braithwaite Bay, Socorro Island (*Velero III*); Galapagos Islands (*Velero III*).

*Diagnosis*.—Carapace broader than long, covered with large mushroom granules. Front divided into 2 blunt teeth. Hepatic and branchial regions elevated. A pterygostomian tooth. Posterior lobes broad and shallow. A triangular tooth on upper base of movable finger.

*Material examined* (44 specimens from 18 stations).—

- 55-33. Lat.  $01^{\circ} 03' 33''$  S, Long.  $90^{\circ} 17' 30''$  W, 60 fms, Feb. 5, 1933, 1 ovig. female (the type, USNM No. 67988).
- 147-34. Tagus Cove, Albemarle Island, 30 fms, Jan. 13, 1934, 1 male, 2 females (USNM No. 69278), 2 males, 2 females (1 illustrated in part) (AHF no. 33008).
- 148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 1 male, 3 females (AHF no. 33009).
- 156-34. In channel off Tagus Cove, Albemarle Island, 80-100 fms, Jan. 15, 1934, 1 female (USNM No. 69744).
- 157-34. Tagus Cove, Albemarle Island, 10-18 fms, Jan. 15, 1934, 1 male, 3 ovig. females (USNM No. 67273).
- 170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 2 ovig. females (AHF no. 34035).
- 171-34. East of Wreck Bay, Chatham Island, 35-40 fms, Jan. 21, 1934, 2 females (USNM No. 69277).
- 173-34. South Seymour Island, 5 fms, Jan. 22, 1934, 1 young female (AHF no. 34036).
- 177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 2 females (AHF no. 34037).
- 183-34. Near Albany Island, James Island, 50-70 fms, Jan. 24, 1934, 1 male, 2 females (USNM No. 69275).
- 190-34. Lat.  $0^{\circ} 55'$  S, Long.  $90^{\circ} 30'$  W, 58-60 fms, Jan. 26, 1934, 2 females (USNM No. 69760).
- 193-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 27, 1934, 1 male (AHF no. 34038).
- 197-34. Off Post Office Bay, Charles Island, 35-40 fms, Jan. 31, 1934, 2 females (AHF no. 34039).
- 201-34. Off Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 1 male, 2 ovig. females (USNM No. 69281).
- 324-35. Tagus Cove, Albemarle Island, 45 fms, Dec. 10, 1934, 2 young (AHF no. 35013).
- 328-35. Tagus Cove, Albemarle Island, 14 fms, Dec. 10, 1934, 3 young males (AHF no. 35014).

792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 1 male (illustrated) (AHF no. 38017).

814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 1 male, 2 young (AHF no. 38018).

*Measurements*.—Female holotype: length 7.2 mm, width 8.0 mm.

*Color in life*.—General appearance pinkish cinnamon with a great number of granules lightly colored with red and vermilion. Some granules a shade darker and a few very highly colored. Eye greenish black. Ventral side same as dorsal but lighter. (Petersen)

*Habitat*.—Sand and rock, sand and shell, sand and coral; rock; coral, nullipore, and rock.

*Depth*.—5-100 fms.

*Remarks*.—This is another instance of a species common to the Galapagos Islands and the Revilla Gigedo group, but not to the adjacent mainland. This time it is Socorro Island, which is nearer the Mexican mainland than Clarion, but still over 400 miles offshore. The remarks made for the preceding species, *Clythrocerus laminatus* Rathbun, apply here as well.

### Genus **LITHADIA** Bell, 1855

#### ***Lithadia cumingii*** Bell

Plate 62, Fig. 1

*Lithadia cumingii* Bell, Trans. Linn. Soc. London, vol. 21, p. 305, pl. 33, figs. 6 and 7, 1855. Rathbun, Bull. 166, U.S. Nat. Mus., p. 136, pl. 38, figs. 1 and 2, 7-15, 1937. Crane, Zoologica, vol. 22, no. 7, p. 102, 1937.

*Type locality*.—Potrero, Costa Rica.

*Type*.—In Mus. Bell.

*Range*.—From Magdalena Bay, Lower California (*Albatross*), to La Plata Island, Ecuador (*Velero III*); Galapagos Islands (*Velero III*).

*Atlantic analogue*.—*L. granulosa* A. Milne Edwards.

*Diagnosis*.—Skull like in appearance. Carapace with deep hollows and upstanding ridges, especially in male. Rostrum produced, narrow, upturned, bilobate at tip. A hepatic lobe or tooth, a posterior branchial lobe, and an intestinal pair closely approximated. Hand carinate.

*Material examined*.—

177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 1 male (photographed) (USNM No. 69418).

*Measurements*.—Young specimen, male: length 5.3 mm, width 5.4 mm.

*Color in life.*—Ground color of carapace olive buff. Granules of frontal and anterolateral portion reddish cadmium orange, those of other areas cadmium yellow to cadmium orange. Eye light yellowish olive. Chelipeds same as carapace but granules on merus and carpus reddish cadmium orange, on hand pale orange. Base of fingers light cadmium orange. Merus and carpus of ambulatory legs same as cheliped but a little more reddish; propodus and dactylus without color, very pale olive buff. Ventral side white. (Petersen)

*Habitat.*—Rock and sand.

*Depth.*—2-51 fms.

*Remarks.*—The single male recorded above appears to be the only Galapagos record for the species, which is common enough along the mainland coast from Lower California to Ecuador. *L. cumingii* is a variable species: not only is there considerable difference between the sexes in shape of carapace, but young specimens show sufficient differences from adults to raise the question as to whether or not more than one species might be present in a given series.

Genus **UHLIAS** Stimpson, 1871

**Uhlias ellipticus** Stimpson

Plate 60, Figs. 4, 5

*Uhlias ellipticus* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 10, p. 117, 1871. Rathbun, Bull. 166, U.S. Nat. Mus., p. 149, pl. 36, figs. 1 and 2, 1937.

*Type locality.*—Panama.

*Type.*—Not extant.

*Range.*—From San Jose Island, Gulf of California (Glassell), to Panama (Stimpson); Galapagos Islands (*Velero III*).

*Atlantic analogue.*—*U. limbatus* Stimpson.

*Diagnosis.*—Carapace thick, broadly elliptical, the expanded margin concealing eyes and antennules. Carapace covered with deep, round or oval pits. Legs cristate; dactyls close against a process of the propodi.

*Material examined* (8 specimens from 5 stations).—

73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 1 female (USNM No. 68261), 1 female (AHF no. 33010).

94-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 1 female (USNM No. 68259).

789-38. South Seymour Island, shore, Jan. 19, 1938, 2 males (1 photographed), 1 female (AHF no. 38019).

796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 1 male (AHF no. 38020).

811-38. Barrington Island, shore, Jan. 26, 1938, 1 female (AHF no. 38021).

*Measurements*.—Male: length 5.4 mm, width 8.1 mm; female: length 5.6 mm, width 8.6 mm.

*Color in life*.—Pure white.

*Habitat*.—Rocky shore.

*Depth*.—Shore

*Remarks*.—A minute species, but positively identifiable in the field because of its pure white, elliptical, eroded carapace. *U. ellipticus* is one of the few oxystomatous crabs not dredged, and like *Dynomene ursula* Stimpson was not known in the Galapagos Islands prior to the advent of *Velero III* collectors.

Subfamily PHILYRINAE

Genus PERSEPHONA Leach, 1817

*Persephona edwardsii* Bell

*Persephona edwardsii* Bell, Trans. Linn. Soc. London, vol. 21, p. 294, pl. 31, fig. 8, 1855. Rathbun, Bull. 166, U.S. Nat. Mus., p. 154, pl. 45, figs. 3, 4, and synonymy, 1937.

*Type locality*.—Galapagos Islands.

*Types*.—In Mus. Bell.

*Range*.—From Panama (Stimpson) to Cape San Francisco, Ecuador (*Velero III*); Galapagos Islands (Bell).

*Diagnosis*.—Three posteriorly directed carapace spines; subhepatic spines wanting. Length and breadth of carapace subequal, a distinct lateral line of granules. Palm high, width equal to more than half of length.

*Material examined*.—None from Galapagos. Hancock collections contain specimens from Pt. Piaxtla, Mexico, to Cape San Francisco, Ecuador, the first an unpublished record.

Genus LEUCOSILIA Bell, 1855

*Leucosilia jurinei* (Saussure)

*Guaia (Ilia) jurinei* Saussure, Rev. Mag. Zool., no. 8, p. 65 (12), pl. 13, fig. 4-4b, 1853.

*Leucosilia jurinii* Bell, Trans. Linn. Soc. London, vol. 2, p. 295, pl. 32, fig. 1, 1855.

*Leucosilia jurinei* Rathbun, Proc. U.S. Nat. Mus., vol. 38, p. 552, pl. 45, fig. 1, 1910; Bull. 166, U.S. Nat. Mus., p. 170, pl. 48, figs. 1-8, and synonymy, 1937.

*Type locality*.—Mazatlan, Mexico.

*Type*.—In Geneva Mus.

*Range*.—Mexico to Peru (Coker); Galapagos Islands (Bell).

*Diagnosis*.—Front bidentate. Carapace with single intestinal, double hepatic, and single subhepatic protuberances; carapace and chelipeds coarsely granulate. Sixth segment of male abdomen protruding backward over fifth.

*Material examined*.—None from the Galapagos Islands. The Hancock collections contain several specimens of this species from Sechura Bay, Peru.

Genus **RANDALLIA** Stimpson, 1857

**Randallia agaricias** Rathbun

Plate 62, Fig. 2

*Randallia agaricias* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 614, pl. 44, figs. 7 and 7a, 1898; Bull. 166, U.S. Nat. Mus., p. 178, pl. 50, figs. 3 and 4, text fig. 40, 1937.

*Type locality*.—Off Cape San Lucas, Lower California, 31 fms.

*Type*.—USNM No. 21601.

*Range*.—From Thurloe Bay, Lower California (*Velero III*), to La Libertad, Ecuador (*Velero III*); Galapagos Islands (*Velero III*).

*Diagnosis*.—Carapace subglobular, a deep pit on either side of median ridge, 4 lobes on posterior border. Frontal margin with a blunt outer tooth. Dorsal tubercles mushroomlike, those of sternum and abdomen beadlike.

*Material examined* (2 specimens from as many stations).—

186-34. Cartago Bay, Albemarle Island, 32 fms, Jan. 25, 1934, 1 male (photographed) (USNM No. 69298).

187-34. Cartago Bay, Albemarle Island, 8-10 fms, Jan. 25, 1934, 1 male (USNM No. 69303).

*Measurements*.—Male specimen: length 6.3 mm, width 6.5 mm.

*Habitat*.—Sand and nullipore, sand and rock.

*Depth*.—3-55 fms.

*Remarks*.—The extreme northern and southern records of the occurrence of the species along the mainland coast of the Americas, as well as the Galapagos record, are the results of the work of Hancock Expedition collectors.

*R. agaricias* is now recognized as a member of the Galapagan fauna.

Family *CALAPPIDAE*Subfamily *CALAPPINAE*Genus *CALAPPA* Weber, 1795*Calappa convexa* Saussure

Plate 62, Fig. 6

*Calappa convexa* Saussure, Rev. Mag. Zool., ser. 2, vol. 5, p. 362 (9), pl. 13, fig. 3, 1853. Rathbun, Zoologica, vol. 5, no. 14, p. 159, 1924; Bull. 166, U.S. Nat. Mus., p. 206, pl. 62, figs. 1-3, and synonymy, 1937.

*Type locality*.—Cape San Lucas, Lower California.

*Type*.—Not extant.

*Range*.—From Magdalena Bay, Lower California (Glassell), to Salinas, Ecuador (Schmitt), Galapagos Islands (Williams Expedition).

*Atlantic analogue*.—*C. flammea* (Herbst).

*Diagnosis*.—Carapace broad, one and one-half times as wide as long, rounded in front, surface low tuberculate, a series of transverse granulated ridges arising from the posterolateral borders. Chelipeds closely approximating carapace; hands with a high dentate crest.

*Material examined* (2 specimens from as many stations).—

170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 1 young (USNM No. 69334).

173-34. South Seymour Island, 5 fms, Jan. 22, 1934, 1 young (photographed) (USNM No. 69758).

*Measurements*.—Young specimen: length 7.0 mm, width 7.9 mm.

*Color in life*.—Carapace hazel on frontal and gastric areas, an undertone of Eugenia red on branchial areas, and white across carapace at cardiac level. A large Eugenia red patch on anterolateral area extending over branchial area but almost covered with small patterns of ochraceous orange and russet. Marginal teeth ochraceous orange. Eystalks tawny; eye pale blue. Chelipeds same as carapace with a large Eugenia red spot across distal end of hand and base of movable finger. Fingers tawny olive shading to very light tips. (Petersen)

*Habitat*.—Sand.

*Depth*.—0-32 fms.

*Remarks*.—*C. convexa* is the commonly encountered "Shame-faced Crab" of the equatorial Pacific. It may be distinguished from the nearly related *C. saussurei* Rathbun by the short, transverse, granulated ridges on the posterolateral portions of the carapace, those of *C. saussurei* being extended beyond the margin of the carapace onto the teeth at the posterolateral angles. It is also taken at shallower depths.



Rathbun (1937) records *Calappa saussurei* from Wreck Bay, Chatham Island, 32 fms, Hancock Expedition of 1934. After examining this specimen, the writer is convinced that it is a young *C. convexa*; indeed, he is unable to distinguish it in any way from the South Seymour Island specimen and has recorded both above.

Genus **MURSIA** Leach, 1823  
**Mursia gaudichaudii** (Milne Edwards)  
Plate 62, Figs. 3, 4

*Platymera gaudichaudii* Milne Edwards, Hist. Nat. des Crustacés, vol. 2, p. 108, 1937.

*Mursia gaudichaudii* Rathbun, Bull. 166, U.S. Nat. Mus., p. 220, pl. 66, figs. 1-3, pl. 67, figs. 1-6, and synonymy, 1937. Crane, Zoologica, vol. 22, no. 7, p. 99, 1937.

*Type locality*.—Chile.

*Type*.—In Paris Mus.

*Range*.—From Farallon Islands (*Albatross*) to Valparaiso, Chile (type loc.); Galapagos Islands (*Velero III*).

*Diagnosis*.—Carapace transversely oval, anterolateral margins arcuate and minutely dentate, posterolateral margins sinuous, entire. A strong lateral spine directed outward; a similar spine at distal end of merus.

*Material examined* (27 specimens from 7 stations).—

191-34. Lat. 0° 55' S, Long. 90° 30' W, 70 fms, Jan. 26, 1934, 2 young (USNM No. 69224), 1 young (AHF no. 34040).

195-34. North of Charles Island, 70-80 fms, Jan. 29, 1934, 10 young (AHF no. 34041).

788-38. SE of Daphne Major Island, 55 fms, Jan. 19, 1938, 1 male (AHF no. 38022).

792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 1 female, 4 young (AHF no. 38023).

795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 1 young (AHF no. 38024).

810-38. (D-2) Barrington Island, 73 fms, Jan. 26, 1938, 2 young (AHF no. 38025).

814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 1 male (photographed), 4 young (AHF no. 38026).

*Measurements*.—Largest specimen, male: length 16.6 mm, width including lateral spine 35.2 mm, length of spine 6.8 mm, cheliped 22.8 mm, chela 11.0 mm, height of chela 8.5 mm, dactyl 5.8 mm.

*Color in life*.—Carapace light olive gray on frontal and anterolateral regions to pale olive gray on intestinal and posterolateral regions, covered with granules of orange red to dragon's blood red. Tubercles of carapace light orange to almost white tips. Eyestalks with blotches of dark orange red; eye dark olive green. Color of carapace extending about one third on spine, blending into bright orange and fading to white at tip. A light touch of orange on marginal teeth. Distal meral spine of cheliped similar to lateral spine of carapace. Carpus darker than carapace with two spines of orange red. Hand pale dull gray above, crested with orange yellow shading to dull pale yellow on middle outer portion and white beneath. Ambulatory legs pale olive gray with touches of vinaceous purple; tips of dactyls white. (Petersen)

*Habitat*.—Sand, sand and coral, sand and mud, sand and rock, sand and shell.

*Depth*.—20-218 fms.

*Remarks*.—*M. gaudichaudii* has the greatest latitudinal range of all Galapagos brachyuran species, from San Francisco, California, to Valparaiso, Chile. This exceeds the range of the dromid, *Dromidia larraburei* Rathbun, which occurs from Monterey Bay, California, to Sechura Bay, Peru. *M. gaudichaudii* has also an extreme bathymetric range, 20-218 fathoms, exceeded by but one other Galapagos species, *Euchiropus americanus* A. Milne Edwards, found from 32-278 fathoms; the extreme depth in this case is an Atlantic record. Apparently *Mursia* is widely tolerant to changes in temperature and pressure.

The affinities of this species are with Japan and Australia, the genus not being found in the Atlantic Ocean. It is characterized by a long lateral spine, suggestive of the attenuated spine of the portunids, particularly *Portunus (A.) acuminatus* Stimpson (not Rathbun, 1930).

*M. gaudichaudii* was not previously recorded from the Galapagos Islands.

Genus **CYCLOËS** de Haan, 1837

**Cycloëus bairdii** Stimpson

Plate 62, Figs. 7, 8

*Cyclois bairdii* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 237 (109), 1860.

*Cycloëus bairdii* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 610, 1898; Bull. 166, U.S. Nat. Mus., p. 225, pl. 69, figs. 3 and 4, and synonymy, 1937. Crane, Zoologica, vol. 22, no. 7, p. 100, 1937.

*Type locality*.—Cape San Lucas, Lower California.

*Types*.—USNM No. 2001.

*Range*.—From Cape San Lucas, Lower California (Xantus), to La Libertad, Ecuador (*Velero III*); Galapagos Islands (Crocker Expedition); also occurs in the Atlantic.

*Diagnosis*.—Carapace circular except for slightly concave postero-lateral margins, length and breadth subequal. Anterolateral margins with beaded edge and a terminal denticle. Eyes large, orbits prominent, especially in young.

*Material examined* (69 specimens from 18 stations).—

- 25-33. Gardner Bay, Hood Island, 2 fms, Jan. 24, 1933, 3 young (USNM No. 68019).  
57-33. Post Office Bay, Charles Island, 4 fms, Feb. 6, 1933, 2 young (AHF no. 33011).  
81-33. Conway Bay, Indefatigable Island, 6 fms, Feb. 16, 1933, 1 soft shell (USNM No. 68018).  
84-33. South Seymour Island, 13 fms, Feb. 18, 1933, 2 young (AHF no. 33012).  
87-33. South Seymour Island, 15 fms, Feb. 19, 1933, 1 male, 2 young, soft shell (AHF no. 33013).  
145-34. North end of Albemarle Island, 6-7 fms, Jan. 12, 1934, 3 males, 2 females (USNM No. 69165).  
146-34. North end of Albemarle Island, shore, Jan. 12, 1934, 2 males (USNM No. 69172).  
170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 2 young (AHF no. 34042).  
173-34. South Seymour Island, 5 fms, Jan. 22, 1934, 5 young (USNM No. 69329).  
196-34. North of Charles Island, 8-10 fms, Jan. 29, 1934, 1 young (AHF no. 34043).  
204-34. Gardner Bay, Hood Island, 30 fms, Jan. 31, 1934, 3 females (AHF no. 34044).  
329-35. Tagus Cove, Albemarle Island, 10 fms, Dec. 10, 1934, 1 young (AHF no. 35015).  
360-35. Gardner Bay, Hood Island, 3 fms, Dec. 19, 1934, 4 young (AHF no. 35016).  
783-38. Darwin Bay, Tower Island, 40-70 fms, Jan. 16, 1938, 1 male (AHF no. 38027).  
785-38. Darwin Bay, Tower Island, 20-40 fms, Jan. 17, 1938, 13 young (1 photographed) (AHF no. 38028).  
790-38. South Seymour Island, 10-20 fms, Jan. 19, 1938, 7 young (AHF no. 38029).  
795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 1 young (AHF no. 38030).

807-38. Academy Bay, Indefatigable Island, 10-25 fms, Jan. 24, 1938, 1 male, 10 young (AHF no. 38031).

*Measurements*.—Male: length 20.4 mm, width 20.9 mm.

*Color in life*.—Ground color of carapace light olive gray with numerous deep purplish vinaceous spots. Ambulatory legs French gray with stripes of purplish lilac, salmon color at distal end of merus. Dactyls light amber yellow. Eyestalks French gray; eyes light green. (Petersen)

*Habitat*.—Sand, sand and coral, sand and rock.

*Depth*.—2-70 fms; 1 shore record, presumably extreme low tide.

*Remarks*.—*C. bairdii* is the only Galapagos oxystome to be found also in the Atlantic. It is even commoner in dredge hauls than the foregoing species, *Mursia gaudichaudii* (Milne Edwards), but has a much more normal range, both geographic and bathymetric. Its Pacific distribution coincides nicely with the belt of warm water extending from Lower California to Cape Santa Elena, Ecuador, its bathymetric range to the surface layers of warmer water also.

#### Subfamily MATUTINAE

Genus **OSACHILA** Stimpson, 1871

***Osachila galapagensis*** Rathbun

Plate 52, Figs. 1-7

*Osachila galapagensis* Rathbun, Proc. Biol. Soc. Washington, vol. 48, p. 3, 1935; Bull. 166, U.S. Nat. Mus., p. 254, pl. 82, fig. 5; pl. 83, fig. 3, 1937.

*Type locality*.—Wenman Island, Galapagos Islands, 100-150 fms.

*Type*.—USNM No. 69215.

*Range*.—Known only from the Galapagos Islands.

*Atlantic analogue*.—Not *O. antillensis* Rathbun (see *Remarks* below).

*Diagnosis*.—Carapace granulate, length little more than three fourths width. Rostrum thick, bilobed. Anterolateral margin completely denticulate, teeth in clusters of 3. Postbranchial prominence high; outer branchial elevation extending both forward and backward of lateral angle. Leg surfaces nearly smooth, edges dentate.

*Material examined* (14 specimens from 6 stations).—

143-34. Wenman Island, 100-150 fms, Jan. 11, 1934, 1 male, 4 females (USNM No. 69215), the type series; 2 females (1 ovig., 1 illustrated) (AHF no. 34045).

147-34. Tagus Cove, Albemarle Island, 30 fms, Jan. 13, 1934, 1 male (USNM No. 69212).

155-34. Off Tagus Cove, Albemarle Island, 50-60 fms, Jan. 15, 1934, 1 male (illustrated in part) (AHF no. 34046).

157-34. Tagus Cove, Albemarle Island, 10-18 fms, Jan. 15, 1934, 1 young female (USNM No. 69213).

190-34. Lat.  $0^{\circ} 55' S$ , Long.  $90^{\circ} 30' W$ , 58-60 fms, Jan. 26, 1934, 1 female (USNM No. 69214), 1 female, 1 carapace (AHF no. 34047).

325-35. Outside of Tagus Cove, Albemarle Island, 80 fms, Dec. 10, 1934, 1 male (USNM).

*Measurements*.—Female: length 20.6 mm, width 24.7 mm.

*Habitat*.—Sand and shell, sand and nullipore; coral, nullipore and rock.

*Depth*.—10-150 fms.

*Remarks*.—*O. galapagensis* is not the true Pacific analogue of the Atlantic *O. antillensis* Rathbun (1916) as given by Rathbun (1937, p. 250). Another and better analogue has been proposed by the writer (1940) in *O. sona* Garth from the Panamanian mainland.

### ***Osachila levis* Rathbun**

Plate 62, Fig. 5

*Osachila levis* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 612, 1898; Bull. 166, U.S. Nat. Mus., p. 254, pl. 78, figs. 3 and 4, 1937.

*Osachila lata* Crane, Zoologica, vol. 22, no. 7, p. 100, 1937 (part: the female specimen, Sta. 150: D16, pl. 1, figs. 3 and 4).

*Type locality*.—Off Cape San Lucas, Lower California, 31 fms.

*Type*.—USNM No. 21598.

*Range*.—From off Cape San Lucas, Lower California (*Albatross*), to La Plata Island, Ecuador (*Velero III*); Galapagos Islands (*Velero III*).

*Diagnosis*.—Surface smooth and punctate, length almost as great as width. Front projecting, bilobate. Anterolateral margins dentate on anterior two-thirds only. Hand paved with sharp tubercles arranged in rows. Leg surfaces entirely smooth.

*Material examined* (8 specimens from 5 stations).—

155-34. Off Tagus Cove, Albemarle Island, 50-60 fms, Jan. 15, 1934, 1 male, 1 female (USNM No. 69754), 1 male (AHF no. 34048).

172-34. East of Wreck Bay, Chatham Island, 12 fms, Jan. 21, 1934, fragment of carapace (AHF no. 34049).

190-34. Lat.  $0^{\circ} 55' S$ , Long.  $90^{\circ} 30' W$ , 58-60 fms, Jan. 26, 1934, 1 female (AHF no. 34050).

792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 2 young males (AHF no. 38032).

814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 1 male (photographed) (AHF no. 38033).

*Measurements*.—Male: length 11.0 mm, width 12.6 mm.

*Habitat*.—Sand and shell, sand and nullipore, sand and mud; rock, coral, nullipore, and bryozoa.

*Depth*.—12-80 fms.

*Remarks*.—Before the Hancock Expeditions began their work in 1931 this species was known only from the unique type, an ovigerous female taken by the *Albatross* off Cape San Lucas, Lower California, in 1888. Its congener, *O. lata* Faxon, was known from but a single specimen, a male (MCZ No. 4497), taken by the *Albatross* off Tres Marias Islands, Mexico, in 1891. Because the disparity between the male and female of each species, as shown by specimens in Hancock collections, is greater than that between the males of both or the females of both, Crane (1937, pl. 1, figs. 1-4) mistakenly figured the male of one and the female of the other as one and the same species.

From a study of the extensive Hancock series of the 3 species, it would seem that *O. lata* is the Gulf of California-Mexican species, *O. galapagensis* Rathbun the Galapagos endemic species, and *O. levis* the widely distributed species of warmer equatorial waters.

Subtribe BRACHYGNATHA

Superfamily OXYRHYNCHA

Family MAJIDAE

Subfamily INACHINAE

Genus STENORYNCHUS Lamarck, 1818

*Stenorynchus debilis* (Smith)

Plate 63, Fig. 1

*Leptodia sagittaria* Milne Edwards and Lucas, d'Orbigny's Voy. l'Amer. Merid., vol. 6, pt. 1, p. 3, 1843; atlas, vol. 9, Crust., pl. 4, figs. 3-3c, 1847; not *L. sagittaria* Leach.

*Leptodia debilis* Smith, Rept. Peabody Acad. Sci. for 1869 and 1870, appendix, p. 87, 1871.

*Stenorynchus debilis* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 568, 1898; Proc. Washington Acad. Sci., vol. 4, p. 283, 1902; Bull. 129, U.S. Nat. Mus., p. 18, pls. 4 and 5, and synonymy, 1925. Boone, Zoologica, vol. 8, no. 4, p. 131, fig. 34, 1927. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 617, 1931. Crane, Zoologica, vol. 22, no. 3, p. 50, 1937.

*Type locality*.—Bay of Realejo, Nicaragua.

*Type*.—MCZ No. 3948.

*Range*.—From Magdalena Bay, Lower California (*Albatross*), to Chile (Milne Edwards and Lucas); Galapagos Islands (Hopkins-Stanford Expedition); low water to 50 fathoms (Crane).

*Atlantic analogue*.—*S. seticornis* (Herbst).

*Diagnosis*.—Rostrum as long as, or longer than, remainder of carapace, its lateral margins spinulose. A small spine located at end of basal article of antenna. Legs exceedingly long and slender.

*Material examined* (26 specimens from 12 stations).—

157-34. Tagus Cove, Albemarle Island, 10-18 fms, Jan. 15, 1934, 1 large male.

177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 1 male, 2 ovig. females.

186-34. Cartago Bay, Albemarle Island, 32 fms, Jan. 25, 1934, 1 young.

190-34. Lat.  $0^{\circ} 55'$  S, Long.  $90^{\circ} 30'$  W, 58-60 fms, Jan. 26, 1934, 1 male.

310-35. Marchena Island, 15 fms, Dec. 3, 1934, 1 male, 1 female.

311-35. Marchena Island, 20 fms, Dec. 3, 1934, 1 young.

322-35. Tagus Cove, Albemarle Island, 10 fms, Dec. 10, 1934, 1 male, 1 female.

326-35. Tagus Cove, Albemarle Island, 15 fms, Dec. 10, 1934, 1 young female.

330-35. Tagus Cove, Albemarle Island, 12 fms, Dec. 10, 1934, 1 male.

345-35. South Seymour Island, 30 fms, Dec. 13, 1934, 1 male, 1 female.

362-35. Hood Island, 20 fms, Dec. 19, 1934, 1 young.

795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 5 males, 5 females (1 ovig.). All but ovigerous female very young

*Measurements*.—Largest male specimen: length, 20.0 mm, width 7.8 mm, cheliped 36.7 mm, chela 16.4 mm, first ambulatory leg 66.0.

*Color in life*.—Ground color of carapace a warm buff with faint orange tint. Rostrum bright apricot orange which becomes darker toward tip. Spines of carapace bright orange red. Stripes of carapace pale apricot orange with double dotted stripe on top. Four stripes of pale yellow on carapace. Ambulatory legs same color as carapace with tint of apricot orange which appears in irregular bands. Legs with numberless tiny spots of brownish black. Dactyl bright apricot orange; nail pale yellow. (Petersen)

*Habitat*.—A variety of bottom conditions is recorded, including rock with sand patches, shell, nullipore, and mud.

*Depth*.—*S. debilis* has been taken by *Velero III* collectors from shore to 60 fms.

*Remarks*.—Because of their exceeding fragility and the fact that most of the specimens were obtained by the cotton swabs of the tangles, only a few of our *S. debilis* from the Galapagos Islands are in perfect condition. The series as a whole is remarkable for the minute size of the specimens. Only two may be considered at all well developed. These, being males, have enlarged and thickened palms, and one of them shows the supplementary spinules along the rostral spine and walking legs particularly well. The fingers of this specimen are hairy.

The vertical range of the species has been extended to 60 fathoms.

Genus **ANOMALOTHIR** Miers, 1879

**Anomalothir hoodensis** Garth

Plate 64, Figs. 1, 2

*Anomalothir hoodensis* Garth, Allan Hancock Pac. Exped., vol. 5, no. 2, pp. 9-11, pl. 1, figs. 1-4, 1939.

*Type locality*.—North of Hood Island, Galapagos Islands, 140-160 fms.

*Type*.—AHF no. 381.

*Range*.—Waters of the central and southern islands of the Galapagos group.

*Atlantic analogue*.—*A. frontalis* (A. Milne Edwards).

*Diagnosis*.—Postorbital spine longer than preorbital. Third and fourth legs of approximately equal length. A single spine on the carpus of the cheliped. Merus of the third leg entire. Carapace little produced posteriorly; no tubercle in front of posterior margin.

*Material examined* (8 specimens from 5 stations).—

792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 2 males.

810-38. (D-1) Barrington Island, 48 fms, Jan. 26, 1938, 1 male, 1 female.

810-38. (D-2) Barrington Island, 73 fms, Jan. 26, 1938, 1 female.

814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 1 male.

817-38. North of Hood Island, Lat.  $1^{\circ} 20' S$ , Long.  $89^{\circ} 40' W$ , 140-160 fms, Jan. 29, 1938, 1 male, 1 female (holotype, AHF no. 381).

*Measurements*.—Female holotype: length 10.8 mm, width 5.6 mm, cheliped 12.6 mm, first ambulatory leg 21.8 mm.



*Color in life*.—Carapace clear pearly gray with numerous orange red dots along midline and continued on rostrum. Eye dark purplish red with green highlights; a few red dots on eyestalk. Merus of ambulatory legs banded with similar dots. Chela with faint tint of orange along upper surface. (Petersen)

*Habitat*.—Sand, sand and shell, sand and mud.

*Depth*.—20-160 fms.

*Remarks*.—This species is the only representative of its genus thus far found on the Pacific side of the Isthmus of Panama. Its similarity to *A. frontalis* (A. Milne Edwards) (1879) of the Atlantic has been noted in the original description. Because of its wide bathymetric range, 20-160 fms, *A. hoodensis* belongs at once to both littoral and abyssal faunas.

### Genus **PODOCHELA** Stimpson, 1860

#### KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Podocheila*

- A<sup>1</sup> Rostrum acuminate, typically bifurcate; a lacinate postorbital lobe . . . . . *P. schmitti*  
 A<sup>2</sup> Rostrum hood shaped; postorbital lobe lacking . . . *P. margaritaria*

### ***Podocheila margaritaria* Rathbun**

Plate 64, Figs. 5, 6

*Podocheila margaritaria* Rathbun, Proc. Washington Acad. Sci., vol. 4, p. 283, pl. 12, fig. 12, 1902; Bull. 129, U.S. Nat. Mus., p. 43, pl. 15; pl. 209, fig. 1, 1925.

*Type locality*.—Tagus Cove, Albemarle Island, Galapagos Islands.

*Type*.—USNM No. 24834.

*Range*.—Previously known only from the type locality, Tagus Cove, Albemarle Island (Hopkins-Stanford Expedition).

*Diagnosis*.—Rostrum broad, hood shaped. Postorbital lobe absent.

*Material examined* (50 specimens from 24 stations).—

- 66-33. Tagus Cove, Albemarle Island, 10-20 fms, Feb. 9, 1933, 1 female.  
 148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 1 male, 1 female.  
 157-34. Tagus Cove, Albemarle Island, 10-18 fms, Jan. 15, 1934, 1 male.  
 161-34. Black Beach, Charles Island, 3 fms, Jan. 17, 1934, 1 large ovig. female.  
 167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 1 ovig. female.

- 177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 2 males, 1 ovig. female.
- 182-34. James Bay, James Island, 30 fms, Jan. 24, 1934, 1 specimen.
- 183-34. James Bay, James Island, 50-70 fms, Jan. 24, 1934, 2 females.
- 193-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 27, 1934, 1 ovig. female.
- 197-34. Off Post Office Bay, Charles Island, 35-40 fms, Jan. 29, 1934, 2 males, 1 female.
- 307-35. Marchena Island, 20 fms, Dec. 3, 1934, 2 large males.
- 310-35. Marchena Island, 15 fms, Dec. 3, 1934, 1 male, 2 females.
- 316-35. Opposite Gordon Rocks, Indefatigable Island, 20 fms, Dec. 8, 1934, 1 male.
- 318-35. Opposite Gordon Rocks, Indefatigable Island, 45 fms, Dec. 8, 1934, 1 female.
- 320-35. Academy Bay, Indefatigable Island, 8-10 fms, Dec. 8, 1934, 2 males.
- 327-35. Tagus Cove, Albemarle Island, 12 fms, Dec. 10, 1934, 1 female.
- 328-35. Tagus Cove, Albemarle Island, 14 fms, Dec. 10, 1934, 1 male, 1 female (photographed).
- 339-35. Sullivan Bay, James Island, 10 fms, Dec. 12, 1934, 1 ovig. female.
- 340-35. Sullivan Bay, James Island, 8 fms, Dec. 12, 1934, 1 male, 1 female.
- 341-35. Sullivan Bay, James Island, 20 fms, Dec. 12, 1934, 3 females.
- 355-35. Gardner Bay, Hood Island, 12 fms, Dec. 17, 1934, 3 males, 6 females (2 ovig.).
- 356-35. Gardner Bay, Hood Island, 12-15 fms, Dec. 17, 1934, 2 males, 2 ovig. females.
- 795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 1 male, 1 female.
- 814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 1 female (color noted).

*Measurements.*—Largest female: length 15.6 mm, width 12.5 mm, first ambulatory leg 45.0 mm, cheliped 17.0 mm.

*Color in life.*—Frontal, gastric, and cardiac areas brick red. Branchial areas a little lighter and with a few light patches. Chela carrot red. Ventral side dark coral pink. Eye brownish black. (Petersen)

*Habitat.*—Rock, sand, shell, coral, and nullipore bottoms.

*Depth.*—3-70 fms.

*Remarks.*—Only the male of the species shows the granulate sternum and abdomen mentioned by Rathbun in the original description. The globular abdomen of the fully developed female is smooth and bare, and the small portion of the sternum left exposed consists of a series of convoluted ridges leading to the bases of the walking legs. The edges of these are cristate, the centers depressed, giving the whole the vermiculate appearance of the corresponding region in *Podochela vestita* Stimpson. But for the fact that in so many instances a male with granulate abdomen and a female with the bare ridges described above, obviously a pair, were taken together, one might be led to believe them two species.

The largest series, taken at two adjacent stations, consists of 13 specimens dredged in 12-15 fathoms in Gardner Bay, Hood Island. This shows not only the wide geographical range of the species within the archipelago but also indicates that the metropolis of the species may be in southern Galapagos waters.

This hooded decorator crab, heretofore believed to be the sole representative of its genus in the archipelago, makes way for a companion species, *P. schmitti* Garth, from which it must now be carefully distinguished by the points given in the above diagnosis.

*P. margaritaria*, hitherto known only from the type specimens of the Hopkins-Stanford Expedition taken at Tagus Cove, occurs throughout the Galapagos Islands at depths of from 5 to 70 fms.

### ***Podochela schmitti* Garth**

Plate 64, Figs. 3, 4

*Podochela schmitti* Garth, Allan Hancock Pac. Exped., vol. 5, no. 2, pp. 11-13, pl. 2, figs. 1-4, 1939.

*Type locality.*—North of Hood Island, Galapagos Islands, 20-40 fms.

*Type.*—AHF no. 382.

*Range.*—Waters surrounding the southern and central islands of the Galapagos group, 20-80 fms.

*Diagnosis.*—Rostrum acuminate, typically bifurcate. Postorbital spine lacinate. First ambulatory leg of male two and one-half times length of carapace.

*Material examined* (20 specimens from 10 stations).—

170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 1 male.

185-34. Cartago Bay, Albemarle Island, 32 fms, Jan. 25, 1934, 1 male, 2 females.

190-34. Lat.  $0^{\circ} 55' S$ , Long.  $90^{\circ} 30' W$ , 58-60 fms, Jan. 26, 1934, 1 male, 1 female.

191-34. Lat.  $0^{\circ} 55' S$ , Long.  $90^{\circ} 30' W$ , 70 fms, Jan. 26, 1934, 1 male, 1 female.

201-34. Off Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 1 specimen.

788-38. SE of Daphne Major Island, 55 fms, Jan. 19, 1938, 1 ovig. female.

792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 4 females.

795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 1 large male.

810-38. (D-2) Barrington Island, 73 fms, Jan. 26, 1938, 2 males.

814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 2 males, 1 female, including the male holotype (AHF no. 382).

*Measurements*.—Male holotype: length 12.8 mm, width 7.9 mm, cheliped 14.6 mm, first ambulatory leg 34.0 mm.

*Color in life*.—Deep olive buff. (Petersen)

*Habitat*.—Sand, sand and rock, sand and mud, sand and shell, sand and nullipore, sand and coral.

*Depth*.—20-80 fms.

*Remarks*.—The acuminate rostrum separates *P. schmitti* distinctly from hooded *P. margaritaria* Rathbun (1902), the other Galapagos member of the genus, and the two median tubercles on the first abdominal segment from *P. hemphillii* Lockington (1877) of the northern fauna, which has but one.

### Genus **EUPROGNATHA** Stimpson, 1871

#### **Euprognatha granulata** Faxon

Plate 53, Figs. 1-6

*Euprognatha granulata* Faxon, Bull. Mus. Comp. Zool., vol. 24, p. 149, 1893; Mem. Mus. Comp. Zool., vol. 18, p. 6, pl. 1, figs. 1 and 1a, 1895. Rathbun, Bull. 129, U.S. Nat. Mus., p. 104, pl. 35, figs. 5 and 6, 1925.

*Type locality*.—Near Cocos Island, 52 fms.

*Cotypes*.—MCZ No. 4477.

*Range*.—Previously known only from the type locality, off Cocos Island, Costa Rica (*Albatross*).

*Diagnosis*.—Anterior margins of postorbital spines laciniated. Antennal spine reaching beyond horns of rostrum.

*Material examined* (104 specimens from 15 stations).—

- 55-33. Lat.  $1^{\circ} 03' 30''$  S, Long.  $90^{\circ} 17' 30''$  W, 60 fms, Feb. 5, 1933, 5 males (1 illustrated), 3 females (1 ovig.).
- 143-34. Wenman Island, 100-150 fms, Jan. 11, 1934, 1 male, 7 females.
- 170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 1 male.
- 183-34. James Bay, James Island, 50-70 fms, Jan. 24, 1934, 2 males.
- 185-34. Cartago Bay, Albemarle Island, 32 fms, Jan. 25, 1934, 6 males, 4 females.
- 190-34. Lat.  $0^{\circ} 55'$  S, Long.  $90^{\circ} 30'$  W, 58-60 fms, Jan. 26, 1934, 1 male, 2 females.
- 201-34. Off Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 3 males, 1 female.
- 318-35. Off Gordon Rocks, Indefatigable Island, 45 fms, Dec. 8, 1934, 2 males, 4 females.
- 324-35. Tagus Cove, Albemarle Island, 45 fms, Dec. 10, 1934, 1 ovig. female.
- 346-35. Between South Seymour and Daphne Islands, 55 fms, Dec. 13, 1934, 1 male.
- 792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 26 males, 21 females.
- 795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 1 male, 1 female.
- 795a-38. Sullivan Bay, James Island, 50-60 fms, Jan. 21, 1938, 1 large male.
- 810-38. (D-2) Barrington Island, 73 fms, Jan. 26, 1938, 2 females.
- 814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 5 males, 2 females.

*Measurements*.—Largest male: length 10.0 mm, width 7.7 mm, cheliped 38.0 mm, chela 19.7 mm.

*Color in life*.—Frontal, cardiac, and gastric regions reddish garnet brown. Branchial region cream buff with numerous orange-red blotches, giving this portion of the carapace a light orange appearance. All spines pale yellow to white tips. Cheliped pearl gray with blotches of ochraceous buff to salmon; orange red at distal end of merus. Ambulatory legs like cheliped; blotches a little darker and light Van Dyke red at distal end of merus. (Petersen)

*Habitat*.—Sand, sand with shell, mud, nullipore, and coral; mud, mud with shell; rock and shell.

*Depth*.—20-150 fms.

*Remarks.*—The specimens obtained by the *Velero III* are the first since Faxon's types and include the only male specimens known.

This species was encountered sparingly until 1938, when a dredge haul made off Daphne Minor Island brought up 47 specimens. This might indicate either that the channel between James and Indefatigable Islands in which Daphne Minor is located may be the metropolis of the species, or simply that the depth of the haul, 70-80 fathoms, is more favorable than the relatively shallow depths at which most of the small boat dredging was done in earlier years.

The geographical range of *E. granulata* has been extended to include the entire Galapagos Archipelago, and its bathymetric range from 52 fathoms to 150 and shoalward to 20.

*Description of the male.*—The male of *Euprognatha granulata* differs from Faxon's description and figure of the female in the following particulars:

1. The ratio of length to breadth of carapace is greater, the male measuring 10.0 mm by 7.7 mm, the female 7 mm by 6 mm.

2. The chelipeds are elongated to almost four times the length of the carapace, or 38 mm, in the 10 mm male above. Of this length the chela occupies over half, or 18.9 mm.

3. The ambulatory legs are correspondingly attenuated and decrease regularly in length from first to last.

4. A third median spine is present in addition to the gastric and cardiac spines mentioned by Faxon and is located on the intestinal region.

5. The pterygostomian region is tumid and is clearly visible in dorsal view between the postorbital lobe and the hepatic spine.

6. The under side of the postorbital lobe is concave.

7. The outer maxilliped, described by Faxon only as granulated, has a triangular merus sharply produced at the anterointernal angle, broadened toward the anteroexternal angle, and but weakly grooved for the insertion of the thickened and compressed palpus. The exognath is also broad, particularly for its basal two-thirds.

8. The male abdomen is widest opposite the third segment and narrowest at the union of the fifth and sixth. The last two segments appear to be fused. A well-developed median spine is present on the first segment, and rudimentary spines on the following two, rather than three, segments.

### Genus **DASYGYIUS** Rathbun, 1897

#### KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Dasygyius*

A<sup>1</sup> Carapace subglobular, rostrum bifid; first leg not appreciably shorter than others; tip of male abdomen triangular .

. . . . . *D. gibbosus*

A<sup>2</sup> Carapace depressed, rostrum simple; first ambulatory leg shortest; tip of male abdomen rounded . . . *D. depressus*

### ***Dasygyius gibbosus* (Bell)**

*Microrynchus gibbosus* Bell, Proc. Zool. Soc. London, vol. 3, p. 88, 1835; Trans. Zool. Soc. London, vol. 2, p. 41, pl. 8, figs. 1-1c, 1836.

*Dasygyius gibbosus* Rathbun, Proc. U.S. Nat. Mus., vol. 38, p. 571, 1910; Bull. 129, U.S. Nat. Mus., p. 138, pl. 274, figs. 1-4, 1925.

*Type locality*.—Galapagos Islands, 6 fms, sandy mud.

*Type*.—Not extant.

*Range*.—Known only from the Galapagos Islands (Bell).

*Diagnosis*.—Carapace subglobular, coarsely granulate, rostrum bifid. Male chelae moderately inflated, dactyl with a large basal tooth. Legs long, cylindrical, hairy, first leg not appreciably shorter than second. Tip of male abdomen narrowly triangular.

*Material examined*.—None.

*Remarks*.—See *Remarks* under the following *D. depressus*.

### ***Dasygyius depressus* (Bell)**

*Microrynchus depressus* Bell, Proc. Zool. Soc. London, vol. 3, p. 88, 1835; Trans. Zool. Soc. London, vol. 2, p. 42, pl. 8, figs. 2, 2d-f, 1836.

*Dasygyius depressus* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 579, 1898; Bull. 129, U.S. Nat. Mus., p. 138, pl. 1; pl. 274, figs. 5-8, 1925. Crane, Zoologica, vol. 22, no. 3, p. 56, 1937.

*Type locality*.—Galapagos Islands, 6 fms, sandy mud.

*Type*.—Not extant.

*Range*.—Gulf of California (*Zaca*); Galapagos Islands (Bell); 6-60 fms (Crane).

*Diagnosis*.—Carapace depressed, finely granulate, rostrum simple. Chelae of male turgid, dactyl without large basal tooth. Legs long, cylindrical, hairy, first ambulatory shortest. A large conical spine on male first abdominal segment.

*Material examined*.—None from the Galapagos Islands.

*Remarks*.—The Hancock collections contain a long series of specimens obtained along the mainland from Concepción Bay, Gulf of California, to Port Utria, Colombia. All were dredged from mud of a type which was not found in the Galapagos Islands, as there are no rivers, with the exception of the small stream at Freshwater Bay, to provide a bottom rich in detritus. Since *D. depressus* has not been taken in Galapagos waters in

over 100 years, and since Cuming, who obtained the original specimens, also visited the mainland of Ecuador, it is possible that he may have confused the localities on this species. The same would hold true for *D. gibbosus* if its habits are at all similar.

Subfamily ACANTHONYCHINAE  
Genus ACANTHONYX Latreille, 1825  
*Acanthonyx petiverii* Milne Edwards

Plate 63, Fig. 4

*Acanthonyx petiverii* Milne Edwards, Hist. Nat. Crust., vol. 1 p. 343, 1834. Rathbun, Bull. 129, U.S. Nat. Mus., p. 142, pl. 44; pl. 222, figs. 1-6, and synonymy, 1925. Boone, Zoologica, vol. 8, no. 4, p. 137, fig. 38, 1927. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 620, 1931. Hult, Arkiv för Zoologi, Band 30A, no. 5, p. 11, 1938.

*Type locality*.—The Antilles.

*Type*.—In Paris Mus.

*Range*.—From Magdalena Bay, Lower California, to Valparaiso, Chile (Dana); Galapagos Islands (Bell); occurs also in the Atlantic.

*Diagnosis*.—A large hepatic lobe and 2 small branchial lobes tufted with hair. Three tufted tubercles on gastric region, one cardiac, one intestinal.

*Material examined* (38 specimens from 12 stations).—

- 27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 1 male.  
38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 5 males, 7 females (3 ovig.), 7 young.  
46-33. Barrington Island, 4-10 fms, Feb. 2, 1933, 2 females.  
66-33. Tagus Cove, Albemarle Island, 10-20 fms, Feb. 9, 1933, 1 male, 1 female.  
146-34. Albemarle Point, Albemarle Island, shore, Jan. 12, 1934, 1 male (photographed), 1 female.  
147-34 to 151-34. Tagus Cove, Albemarle Island, Taylor's sargassum, Jan. 13, 1934, 1 specimen.  
152-34. Tagus Cove, Albemarle Island, coral, Jan. 14, 1934, 2 ovig. females.  
154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 1 male, 1 female.  
157-34. Tagus Cove, Albemarle Island, 10-18 fms, Jan. 15, 1934, 1 male.  
161-34. Black Beach, Charles Island, 3 fms, Jan. 17, 1934, 2 males, 2 young.



166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 1 small male.

169-34. Academy Bay, Indefatigable Island, 15-25 fms, Jan. 20, 1934, 1 young.

*Measurements*.—Largest male: length 21.3 mm, width 14.0 mm, cheliped 22.0 mm, chela 11.1 mm, first ambulatory leg 26.0 mm.

*Habitat*.—Seaweeds.

*Remarks*.—This species, which has been known to occur in the Galapagos Islands since earliest times, is generally secured from marine plant washings.

A large series of tiny individuals was obtained, probably from algal washings, at a shore station at Cormorant Point, Charles Island. The series consisted of 5 male and 7 female specimens, of which 3 were ovigerous, and 7 young. It was possible to distinguish the sex quite readily on specimens 3 mm or more in length, and a 7.5 mm female was found carrying eggs. This is but one-third the length of the male the measurements of which are given above.

### Genus *EUPLEURODON* Stimpson, 1871

#### *Eupleurodon rathbunae* Garth

*Epialtus peruvianus* Finnegan, Journ. Linn. Soc. London, vol. 37, p. 620, 1931.

*Eupleurodon rathbunae* Garth, Allan Hancock Pac. Exped., vol. 5, no. 2, p. 13, pl. 3, figs. 1-5, 1939.

*Type locality*.—Gardner Bay, Hood Island, Galapagos Islands.

*Type*.—USNM No. 77366.

*Range*.—Known only from the type locality.

*Diagnosis*.—Carapace foreshortened, wider between anterolateral than between posterolateral lobes. No preocular tooth. No small tooth on lateral margin between the two lobes. Distance between anterior lobes greater than distance from the tip of anterior lobe to middle of posterior border.

*Material examined*.—

27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, female holotype (USNM No. 77366).

*Measurements*.—Female holotype: length of carapace including rostrum 7.1 mm, width 5.3 mm, length of rostrum 2.1 mm.

*Habitat*.—Among algae.

*Remarks*.—Although the writer has not seen the Crossland specimen referred to *Epialtus peruvianus* Rathbun by Finnegan (1931), a camera lucida drawing made by Dr. Isabella Gordon of the British Museum

proves it to be identical with the *Eupleurodon* under consideration. It is exceedingly unfortunate that three questionable species, *Eupleurodon trifurcatus* Stimpson (1871), *Epialtus peruvianus* Rathbun (1924) (which should be transferred to *Eupleurodon* and given another specific name), and *Eupleurodon rathbunae* Garth were all described from single specimens and that the type of the first no longer exists. Having found so little infiltration of the Peruvian crustacean fauna into the Galapagos Islands, the writer deemed it best to consider a specimen of doubtful affinities a distinct, endemic species, rather than to attribute to a mainland species, and particularly a sub-Antarctic one, an extension of range having far greater implications than are justified under the circumstances. To quote the pioneer carcinologist, Wm. Stimpson: "We have named it because we consider it far better for the interest of science to admit a slight risk of adding a synonym, than to refer a species to a locality at which it does not exist, which would tend to confuse our ideas upon geographical distribution, a knowledge of which constitutes one of the most important aims in our investigation of species." (Ann. Lyc. Nat. Hist. New York, vol. 7, p. 50 (178), 1860.)

Genus **TALIEPUS** A. Milne Edwards, 1878

**Taliepus marginatus** (Bell)

*Epialtus marginatus* Bell, Proc. Zool. Soc. London, vol. 3, p. 173, 1835; Trans. Zool. Soc. London, vol. 2, p. 62, pl. 11, fig. 4, 4i-k; pl. 13, 1836.

*Taliepus marginatus* Rathbun, Bull. 129, U.S. Nat. Mus., p. 164, pls. 52 and 53; pl. 220, fig. 2; pl. 221, and synonymy, 1925.

*Type locality*.—"Ad oras Brasiliae."

*Type*.—Not extant.

*Range*.—From Independencia Bay, Peru (Coker) to Guaiacan, Chile (Lenz); Galapagos Islands (Bell); Brazil (Bell).

*Diagnosis*.—Carapace smooth, broadly oval. A preorbital but no post-orbital tooth. A small hepatic and large anterolateral tooth. An inferior distal tooth on the propodus of each ambulatory leg. Chelipeds of adult male large and powerful.

*Material examined*.—None from the Galapagos Islands. The Hancock collections contain specimens from Independencia and San Juan Bays, Peru.

Genus **SPHENOCARCINUS** A. Milne Edwards, 1875**Sphenocarcinus agassizi** Rathbun

Plate 63, Fig. 2

*Sphenocarcinus agassizi* Rathbun, Proc. U.S. Nat. Mus., vol. 16, p. 231, 1893; Bull. 129, U.S. Nat. Mus., p. 188, pl. 63; pl. 223, figs. 1 and 2, 1925. Faxon, Mem. Mus. Comp. Zool., vol. 18, p. 7, pl. 1, figs. 3 and 3a, 1895. Crane, Zoologica, vol. 22, no. 3, p. 58, 1937.

*Type locality*.—Gulf of California, 14 fms.

*Type*.—USNM No. 17343.

*Range*.—From Cape Tepoca, Gulf of California (*Albatross*), to Panama (*Albatross*); 14 to 71 fms.

*Atlantic analogue*.—*S. corrosus* A. Milne Edwards.

*Diagnosis*.—Rostrum formed of 2 blunt spines contiguous to tips. Lateral margins of carapace coarsely dentate.

*Material examined* (5 specimens from 2 stations).—

792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 1 male, 3 young.

810-38. Barrington Island, 48-73 fms, Jan. 26, 1938, 1 female (photographed).

*Measurements*.—Largest specimen, female: length 24.6 mm, width 18.8 mm, rostrum 10.0 mm, cheliped 19.2 mm, chela 8.5 mm, first ambulatory leg 26.8 mm.

*Color in life*.—Ground color of carapace pink with grayish hue. A pair of broad bands of vinaceous rufous extending from behind front to intestinal region, one on either side of median line. Median frontal portion light cerulean blue. Anterolateral teeth yellow orange. Cheliped orange buff at base to yellow cinnamon buff on hand and fingers. First three ambulatory legs pale orange cinnamon, last leg yellow cinnamon buff banded with vinaceous rufous. (Petersen)

*Habitat*.—Sand, mud and sand.

*Depth*.—14-80 fms.

*Remarks*.—The finding of this species in 1938 and not in previous years is attributable to the deeper dredging attempted. *S. agassizi* is common enough in the Gulf of California but has not before been taken in the Galapagos Islands.

No particular significance is attached to the circumstance of taking the Daphne Minor specimens in association with a holothurian, as none of the subfamily Acanthonychinae, to which *Sphenocarcinus* belongs, are known to the writer to be commensal in habitat.

Subfamily **PISINAE**  
 Genus **PELIA** Bell, 1835  
**Pelia pulchella** Bell

*Pelia pulchella* Bell, Proc. Zool. Soc. London, vol. 3, p. 170, 1835;  
 Trans. Zool. Soc. London, vol. 2, p. 45, pl. 9, figs. 2, 2d-f, 1836.  
 Rathbun, Bull. 129, U.S. Nat. Mus., p. 284, pl. 241, figs. 1-4, 1925.

*Type locality*.—Galapagos Islands, 6 fms, sandy mud.

*Type*.—Not extant.

*Range*.—Known only from the original specimen collected by Cuming in 1829.

*Diagnosis*.—Carapace pyriform, hairy, regions well defined. Rostrum deeply cleft, equal to nearly one-half of carapace length. Male chelipeds long, carinated, gap of movable finger closed by a tooth on pollex. Basal article of antenna exposed in dorsal view. (Based on Bell's description.)

*Material examined*.—None.

Genus **PISOIDES** Milne Edwards and Lucas, 1843  
**Pisoides edwardsii** (Bell)

*Hyas edwardsii* Bell, Proc. Zool. Soc. London, vol. 3, p. 171, 1835;  
 Trans. Zool. Soc. London, vol. 2, p. 49, pl. 9, fig. 5, 1836.

*Pisoides edwardsii* Dana, U.S. Expl. Exped., vol. 13, Crust., p. 87, 1852;  
 atlas, pl. 1, figs. 2a-b, 1855. Rathbun, Bull. 129, U.S. Nat. Mus.,  
 p. 285, pl. 236, and synonymy, 1925.

*Type localities*.—Valparaiso and Galapagos Islands.

*Type*.—Not extant.

*Range*.—From Panama (A. Milne Edwards) to Straits of Magellan;  
 Galapagos Islands (Bell).

*Diagnosis*.—Carapace broadly triangular, longer than wide, gastric and cardiac regions prominent. Rostrum deflected, horns broad and divergent. Basal antennal article broad, a spinulose tubercle at its outer angle; succeeding articles wide, depressed, hairy. A large, acute postorbital spine.

*Material examined*.—None from Galapagos. The Hancock collections contain specimens from the bays of San Juan and San Nicolas, Peru.

Genus **HERBSTIA** Milne Edwards, 1834  
 KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Herbstia*

- A<sup>1</sup> Posterior margin of carapace strongly produced; ambulatory legs  
 longer than chelipeds . . . . . *H. pyriformis*  
 A<sup>2</sup> Posterior margin of carapace rounded; ambulatory legs shorter  
 than cheliped of adult male . . . . . *H. edwardsii*

***Herbstia edwardsii* Bell**

Plate 65, Figs. 1, 2

*Herbstia edwardsii* Bell, Proc. Zool. Soc. London, vol. 3, p. 170, 1835 (1836); Trans. Zool. Soc. London, vol. 2, p. 46, pl. 9, figs. 3, 3g-i, 1836. Rathbun, Bull. 129, U.S. Nat. Mus., p. 300, pl. 105, figs. 3 and 4; pl. 240, figs. 1-4, 1925. Boone, Zoologica, vol. 8, no. 4, p. 145, fig. 42, 1927. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 623, 1931. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 11, 1933, part; not the 2 mm specimen. Hult, Arkiv för Zoologi, Band 30A, no. 5, p. 11, 1938.

*Type locality*.—Galapagos Islands, 6 fms, coral sand.

*Type*.—Not extant.

*Range*.—Galapagos Islands, shore to 6 fms.

*Diagnosis*.—Carapace rounded behind, narrowing before, lateral margin with a few spinules. Chelipeds of adult male longer than ambulatory legs; 2 teeth in gape of movable finger. Meri of ambulatory legs spinulose above.

*Material examined* (180 specimens from 29 stations).—

- 27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 4 males, 4 females.  
30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 2 females.  
33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 6 males, 4 females.  
38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 1 female.  
69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 1 female.  
73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 3 males, 4 females, 4 young.  
76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 1 male, 4 females.  
80-33. Duncan Island, coral, Feb. 15, 1933, 6 males, 6 females.  
82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 2 females (1 ovig.).  
94-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 1 male, 2 ovig. females.  
97-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 1 female.  
98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 3 males, 1 female.  
166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 3 males, 3 females.

- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 2 females.
- 199-34. Black Beach, Charles Island, shore, Jan. 30, 1934, 3 males, 5 females.
- 313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 10 males, 7 females (6 ovig.).
- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 3 males, 3 females.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 1 male.
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 3 males, 3 females.
- 350-35. South Seymour Island, shore, Dec. 13, 1934, 1 female.
- 351-35. South of Black Beach, Charles Island, shore, Dec. 14, 1934, 1 male, 2 females.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 3 males, 4 females (1 ovig.).
- 784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 2 males, 3 females.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 10 males (1 photographed), 10 females.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 10 males, 15 females, 1 young.
- 800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 3 females (1 ovig.).
- 803-38. Black Beach, Charles Island, shore, Jan. 23, 1938, 3 males, 1 female.
- 804-38. Onslow Island, off Charles Island, coral, Jan. 23, 1938, 1 male, 1 female.
- 811-38. Barrington Island, coral, Jan. 26, 1938, 2 females, 1 young.

*Measurements*.—Largest male: length 15.8 mm, width 13.9 mm, cheliped 30.0 mm, chela 15.2 mm.

*Color in life*.—Chelae dusky dark brown, fingers white. Carapace light bluish gray. (Petersen). General appearance pink to magenta, the lightest coloring about the leg joints. Chelipeds much darker, almost black, dactyls pure white. A series of 17 remarkably uniform. (Garth)

*Habitat*.—Holes in narrow rock shelf and cave. (Finnegan)

*Depth*.—Shore to 6 fms.

*Remarks*.—This species, nowhere abundant, was occasionally obtained from coral, but more generally from ordinary rocky shore. Its flatness and slender, naked chelae serve to distinguish it from the sponge-covered young of *Mithrax* (*Mithrax*) *bellii* Gerstaecker, the species with which it is most readily confused in the field.

The largest series, consisting of 17 specimens, was collected at Black Beach, Charles Island. It was noticed that an unusually large proportion of the females were ovigerous, 6 of the 7 having a full complement of eggs.

### ***Herbstia pyriformis* (Bell)**

Plate 63, Fig. 3

*Rhodia pyriformis* Bell, Proc. Zool. Soc. London, vol. 3, p. 170, 1835 (1836); Trans. Zool. Soc. London, vol. 2, p. 44, pl. 9, figs. 1-1c, 1836.

*Herbstia pyriformis* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 10, p. 93, 1871. Rathbun, Bull. 129, U.S. Nat. Mus., p. 301, pl. 104, figs. 2 and 3; pl. 240, figs. 5-8, 1925.

*Type locality*.—Galapagos Islands, 6 fms, coral sand.

*Type*.—Not extant.

*Range*.—Known only from the type locality and from James Island (Hassler Expedition).

*Diagnosis*.—Carapace pyriform, posterior margin strongly produced, lateral margin with 4 spines. Ambulatory legs longer than chelipeds. A spine on palm. Meri of ambulatory legs without spines, red banded.

*Material examined* (14 specimens from 7 stations).—

27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 1 young female.

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 1 male, 3 young females.

154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 1 large female.

194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 2 females.

343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 3 males (1 photographed).

796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 2 females.

800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 1 female.

*Measurements*.—Largest specimen, female: length 26.0 mm, width 19.7 mm, cheliped 26.3 mm, chela 11.8 mm, second ambulatory leg (the longest) 35 mm; largest male: length 21.4 mm, width 16.0 mm, cheliped 20.0 mm.

*Color in life*.—Carapace light ochre red on gastric and cardiac areas. Branchial and frontal portions Van Dyke red; marginal teeth white. A white triangular spot on postbranchial and intestinal regions. Merus of cheliped light vinaceous fawn with bands of vivid Van Dyke red. Dark

Van Dyke red bands at distal ends of merus and on carpus. Hand Pompeian red; movable finger carmine, tip orange yellow. Fixed finger similar, fading to white at tip. Ambulatory legs same as merus of cheliped. Propodus a shade darker with bands of Indian lake. Dactyl Indian lake; nail yellow. (Petersen)

*Habitat*.—Rocky shore.

*Remarks*.—*H. pyriformis* was considered a rarity by Hancock Expedition collectors, who were always on the alert for its telltale "peppermint stick" legs. The species had been known previously by the type specimen collected by Cuming circa 1829, no longer extant, and by the Hassler specimen, collected in 1872. Both of these specimens were males.

The young of the species are very hairy, this feature being especially noticeable on the last three segments of the ambulatory legs. The smallest specimen in the series measures 7 mm in length.

The female of *H. pyriformis* is now known and the range of the species is hereby extended to include six of the islands of the Galapagos group.

Genus **LISSA** Leach, 1815

**Lissa aurivilliusi** Rathbun

Plate 65, Figs. 3, 4

*Lissa aurivilliusi* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 575, pl. 41, fig. 4, 1898; Proc. Washington Acad. Sci., vol. 4, p. 284, 1902; Bull. 129, U.S. Nat. Mus., p. 333, pl. 246, fig. 2, 1925. Crane, Zoologica, vol. 22, no. 3, p. 59, 1937.

*Type locality*.—Off Cape San Lucas, 31 fms.

*Type*.—USNM No. 21575.

*Range*.—From Magdalena Bay, Lower California (*Albatross*), to Cape San Lucas (*Albatross*); Galapagos Islands (Hopkins-Stanford Expedition); to 35 fms (Crane).

*Atlantic analogue*.—*L. bicarinata* Aurivillius.

*Diagnosis*.—Gastric elevation angular, continued posterolaterally as a sharp branchial crest. Posterior margin doubly concave; a cardiac elevation.

*Material examined* (18 specimens from 12 stations).—

167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 1 young female.

169-34. Academy Bay, Indefatigable Island, 15-25 fms, Jan. 20, 1934, 1 female (photographed).

183-34. James Bay, James Island, 50-70 fms, Jan. 24, 1934, 2 young males.



- 187-34. Cartago Bay, Albemarle Island, 8-10 fms, Jan. 25, 1934, 1 young female.
- 193-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 27, 1934, 2 females.
- 201-34. Off Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 1 male, 3 females.
- 204-34. West of Gardner Bay, Hood Island, 30 fms, Jan. 31, 1934, 1 male, 1 female.
- 308-35. Marchena Island, 3-5 fms, Dec. 3, 1934, 1 male.
- 322-35. Tagus Cove, Albemarle Island, 10 fms, Dec. 10, 1934, 1 female.
- 328-35. Tagus Cove, Albemarle Island, 14 fms, Dec. 10, 1934, 1 female.
- 341-35. Sullivan Bay, James Island, 20 fms, Dec. 12, 1934, 1 male.
- 356-35. Gardner Bay, Hood Island, 12-15 fms, Dec. 17, 1934, 1 female.

*Measurements*.—Photographed specimen: length 8.7 mm, width 7.4 mm.

*Color in life*.—From Gulf of California specimen: entire dorsal surface of carapace dull yellow orange with numerous indistinct darker small spots. Chelipeds as carapace, finger tips white. Ambulatory legs white with but little color. Ventral side pale gray with light touches of dull orange. (Petersen)

*Habitat*.—Rock, frequently covered with red algae; rock and sand; rock and shell; sand.

*Depth*.—3-70 fms.

*Remarks*.—A single specimen taken on a reef north of Tagus Hill by the Hopkins-Stanford Expedition appears to be the only previous Galapagos record for the species. It is now known to occur throughout the archipelago to a depth of 70 fms.

All Galapagos *Lissas* were subjected to careful scrutiny in the hope that some of them might prove to be *L. tuberosa*, encountered by Hancock Expeditions from the Gulf of California to Colombia along the mainland. However, none had the cristate legs and double crests on the carpus characteristic of this species.

Both sponge and bryozoan encrustations were observed on Galapagos specimens.

Subfamily **MAJINAE**  
Genus **THOE** Bell, 1835  
**Thoe erosa** Bell

*Thoe erosa* Bell, Proc. Zool. Soc. London, vol. 3, p. 171, 1835; Trans. Zool. Soc. London, vol. 2, p. 48, pl. 9, figs. 4, 4k-o, 1836. Rathbun, Bull. 129, U.S. Nat. Mus., p. 351, pl. 249, figs. 1-6 and synonymy, 1925.

*Type locality*.—Galapagos Islands, 7 fms, sandy mud.

*Type*.—Not extant.

*Range*.—Bay of Santa Elena, Ecuador (Nobili); Galapagos Islands (Bell).

*Diagnosis*.—Carapace depressed, posteriorly and laterally rounded, tuberculous. Rostrum minute, bifurcate. Only one anterior lobe on basal antennal article. Both rows of rectangular excavations on merus of cheliped fully developed. Fingers slender and widely gaping; a single tooth at basal third of movable finger.

*Material examined*.—None.

*Remarks*.—Judging from the writer's experience in collecting *Thoe sulcata* Stimpson at Socorro Island, Mexico, and in collecting *T. panamensis* Nobili on the mainland from Costa Rica to Gorgona Island, Colombia, *T. erosa* would most probably be encountered among sponge-covered rocks at extreme low tide. Since the type of collecting which yielded the two former species was the type most frequently pursued by *Velero III* collectors in the Galapagos Islands, it is difficult to understand why the Bell species, if present, was not uncovered.

Genus **PITHO** Bell, 1835

KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Pitho*

- A<sup>1</sup> Five anterolateral teeth, the second and third united at bases . . . . . *P. quinquedentata*  
A<sup>2</sup> Six acute anterolateral teeth, the second and third separated at bases . . . . . *P. sexdentata*

**Pitho quinquedentata** Bell

*Pitho quinquedentata* Bell, Proc. Zool. Soc. London, vol. 3, p. 172, 1835. Rathbun, Bull. 129, U.S. Nat. Mus., p. 361, pl. 250, figs. 1-4, and synonymy, 1925.

*Type locality*.—Galapagos Islands, sandy mud, 6 fms.

*Type*.—Not extant.

*Range*.—Panama (A. Milne Edwards); Galapagos Islands (Bell).

*Atlantic analogue*.—*P. lherminieri* (Schramm).

*Diagnosis*.—Male carapace anteriorly broad, posteriorly narrow; female carapace broadened posteriorly as well. Front wide, rostral and inner orbital teeth in the same transverse line. Five lateral teeth, excluding outer orbital, the second and third fused at base, the fourth and fifth reduced in the male, in the female the fifth only.

*Material examined*.—None from the Galapagos Islands. The Hancock collections contain a considerable series of this species from Isabel Island, Mexico, to Bahia Honda, Panama.

### ***Pitho sexdentata* Bell**

*Pitho sexdentata* Bell, Proc. Zool. Soc. London, vol. 3, p. 172, 1835. Rathbun, Bull. 129, U.S. Nat. Mus., p. 367, pl. 130, fig. 1; pl. 250, figs. 5-9, and synonymy, 1925. Sivertsen, Med. fra det Zool. Mus. Oslo, no. 38, p. 11, 1933. Crane, Zoologica, vol. 22, no. 3, p. 60, 1937.

*Type locality*.—Galapagos Islands, sandy mud, 6 fms.

*Type*.—Not extant.

*Range*.—From Santa Inez Bank, Gulf of California (Crane), to Galapagos Islands (Bell).

*Atlantic analogue*.—*P. mirabilis* (Herbst).

*Diagnosis*.—Carapace broadly rounded in both sexes, granulate and hairy. Front narrow, rostral teeth acute. Six lateral marginal teeth, exclusive of outer orbital, all acute, separated at their bases, the sixth reduced in size and at a higher level.

*Material examined*.—A cast from Galapagos Islands. The Hancock collections contain specimens from Manta and Cape San Francisco, Ecuador.

*Remarks*.—A cast of *P. sexdentata* was picked up by a crew member while beach combing. Since several days elapsed before it came to the attention of the carcinologists, it was impossible to assign to it a more exact locality than Galapagos.

### Genus **MITHRAX** Latreille, 1817

#### KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Mithrax*

- A<sup>1</sup> Carapace without oblique branchial furrows (Subgenus *Mithrax*)
  - B<sup>1</sup> Rostral spines long, divergent; carapace longer than broad, spinulous . . . . . *M. (Mithrax) spinipes*
  - B<sup>2</sup> Rostral horns short, tuberculate or subtruncate; carapace broader than long . . . . .

- C<sup>1</sup> Carapace paved with smooth, flat granules; rostrum tuberculate; size large . . . . *M. (Mithrax) bellii*  
 C<sup>2</sup> Carapace with 2 rows of lateral marginal spines, rostrum subtruncate; size small . . . . *M. (Mithrax) pygmaeus*  
 A<sup>2</sup> Carapace with oblique branchial furrows (Subgenus *Mithraculus*)  
 B<sup>1</sup> Three large anterolateral lobes; inner margin of entire cheliped laminated . . . . *M. (Mithraculus) nodosus*  
 B<sup>2</sup> Two acute tubercles and a spine on anterolateral margin; carpus only of cheliped, laminated . . . . .  
 . . . . . *M. (Mithraculus) denticulatus*

### Subgenus MITHRAX

### *Mithrax (Mithrax) spinipes* (Bell)

Plate 65, Figs. 5, 6

- Pisa spinipes* Bell, Proc. Zool. Soc. London, vol. 3, p. 171, 1835 (1836); Trans. Zool. Soc. London, vol. 2, p. 50, pl. 9, figs. 6, 6s-u, 1836.  
*Mithrax (Mithrax) spinipes* Rathbun, Bull. 129, U.S. Nat. Mus., p. 391, pl. 136, figs. 3 and 4; pl. 262, fig. 5, 1925. Boone, Zoologica, vol. 8, no. 4, p. 154, fig. 48, 1927. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 12, 1933. Crane, Zoologica, vol. 22, no. 3, p. 60, 1937.  
*Mithrax (Mithrax) mexicanus* Glassell, Zoologica, vol. 21, no. 17, p. 213, 1936.

*Type localities*.—Galapagos Islands, 16 fms; Santa Elena, 6 fms.

*Types*.—Not extant.

*Range*.—From Gulf of California (*Albatross*) to Santa Elena, Ecuador, and the Galapagos Islands (Bell); 2½-33 fms.

*Atlantic analogue*.—*M. acuticornis* Stimpson.

*Diagnosis*.—Based on immature specimens: carapace elongate oval, spinulose, rostral horns long and divergent. A series of anterolateral spinules which develop into 5 lateral spines in the adult. Paired mesogastric tubercles of adult not always apparent in young specimens. No lateral angle, as in older specimens.

*Material examined* (3 specimens from as many stations).—

155-34. Tagus Cove, Albemarle Island, 50-60 fms, Jan. 15, 1934, 1 male.

814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 1 male (photographed).

817-38. North of Hood Island, 140-160 fms, Jan. 29, 1938, 1 male.

*Measurements*.—Young male: length 11.3 mm, width 6.5 mm.

*Color in life*.—Carapace olive buff with yellowish tint. Touches of red around bases of spines. Eye dull dark purple. Cheliped pale cream buff with a few blotches of vermilion and green. Legs pale cream buff banded with deep olive buff with orange-red margins. (Petersen)

*Habitat*.—Sand, sand and shell; also one varied bottom marked "rock, coral, nullipore, and bryzoa."

*Depth*.—2½-160 fms.

*Remarks*.—*M. (M.) spinipes* is a companion species, in point of habitat, with *Anomalothir hoodensis* Garth, being encountered in both deep and shallow dredging. A depth of 160 fms, recorded on the 1938 cruise, represents a valuable extension of bathymetric range, the Albemarle Island record a new locality within the archipelago.

A Galapagos specimen of *M. (M.) spinipes* has been compared with the type of *M. (M.) mexicanus* Glassell (1936) by Miss Jocelyn Crane of the New York Zoological Society, who finds them identical. Miss Crane allows herself to be quoted to the effect that she has seen examples clearly intermediate in development of anterolateral spines, shape of carapace, and development of paired anteromesogastric tubercles between the two, which would indicate *M. (M.) mexicanus* to be the young of *M. (M.) spinipes*.

### ***Mithrax (Mithrax) bellii* Gerstaecker**

Plate 66, Figs. 1, 2

*Mithrax ursus* Bell, Proc. Zool. Soc. London, vol. 3, p. 171, 1835 (1836) (not *Cancer ursus* Herbst, 1788); Trans. Zool. Soc. London, vol. 2, p. 52, pl. 10, figs. 2, 2c-e, 1836.

*Mithrax bellii* Gerstaecker, Arch. für Naturg., vol. 22, pt. 1, p. 112, 1856; name substituted for *M. ursus* Bell (not Herbst).

*Mithrax (Mithrax) bellii* Rathbun, Bull. 129, U.S. Nat. Mus., p. 403, pls. 142 and 143, 1925. Boone, Zoologica, vol. 8, no. 4, p. 155, fig. 49, 1927. Hult, Arkiv. för Zoologi, Band 30A, no. 5, p. 11, 1938.

*Type locality*.—Galapagos Islands.

*Type*.—Not extant.

*Range*.—Galapagos Islands, shore to a depth of 6 fms, (Bell); Chile (Miers).

*Atlantic analogue*.—*M. (M.) verrucosus* Milne Edwards.

*Diagnosis*.—Carapace paved with flat, round granules. Five tubercles on inner margin of wrist. Margin broken into numerous irregular tubercles.

*Material examined* (76 specimens from 28 stations).—

33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 2 males, 2 females.

- 38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 1 large male.
- 48-33. Barrington Island, shore, Feb. 2, 1933, 1 young female.
- 65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 2 males.
- 68-33. South of Cape Berkeley, Albemarle Island, shore, Feb. 10, 1933, 2 small males.
- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 1 male.
- 76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 3 females (1 photographed).
- 85-33. North Seymour Island, shore, Feb. 18, 1933, 1 male.
- 154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 1 female, 1 young.
- 163-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 1 large male.
- 166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 3 males, 3 young.
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 1 large male.
- 173-34. South Seymour Island, 5 fms, Jan. 22, 1934, 1 male.
- 175-34. North Seymour Island, shore, Jan. 22, 1934, 2 young.
- 188-34. Cartago Bay, Albemarle Island, shore, Jan. 25, 1934, 1 male.
- 199-34. Black Beach, Charles Island, shore, Jan. 30, 1934, 1 male.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 1 male.
- 313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 2 males, 2 females.
- 314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 1 male.
- 350-35. South Seymour Island, shore, Dec. 13, 1934, 1 young.
- 351-35. South of Black Beach, Charles Island, shore, Dec. 14, 1934, 1 male.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 2 males, 2 females, 2 young.
- 784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 1 male, 2 females.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 3 males, 3 females, 3 young.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 1 female, 2 young.
- 800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 6 males, 7 females.

803-38. Black Beach, Charles Island, shore, Jan. 23, 1938, 1 female, 1 young.

804-38. Onslow Island, off Charles Island, coral, Jan. 23, 1938, 1 young.

*Measurements*.—Largest female: length 53.7 mm, width 56.6 mm, cheliped 60.0 mm, chela 28.9 mm.

*Color in life*.—Frontal, gastric, and cardiac areas, tips of marginal teeth, and spines of carapace pansy purple. Branchial and hepatic regions dahlia purple. Cheliped light brick red at base to pansy purple at extremity; hand Pompeian red, tips of fingers white. Ambulatory legs similar to cheliped; nail cadmium orange. (Petersen)

*Habitat*.—Rocky shore.

*Depth*.—Shore to 6 fms.

*Remarks*.—Young individuals are invariably sponge encrusted, sometimes so heavily as to be totally unrecognizable. The sponge seems always to be of the same light gray color and delicate texture. Older specimens are completely naked and of the bright shades of red described above.

A small male from a reef north of Tagus Hill, Albemarle Island, compares in an interesting manner with a specimen of similar size of *Mithrax (Mithrax) spinipes* (Bell) from San Francisco Island, Gulf of California, Allan Hancock Expedition of 1936. This young male is spinulose: the rostral and orbital horns are acute like those of *spinipes* but are of relatively smaller size. On a key like Rathbun (1925, p. 380), based upon adult characters, the young *bellii* keys to *spinipes*. A 17.5 mm specimen clearly shows the transition from spines to the tubercles and granular pavement of the adult carapace. It is quite possible that a similar transition takes place in the case of *spinipes*, as indicated in the discussion of that species. However, we do not yet possess specimens of *spinipes* of size comparable to the tuberculate and granulate adults of *bellii*; that is, not unless the adults have been given another specific name, such as *Mithrax (Mithrax) orcutti* Rathbun, of which the young in turn are unknown.

### *Mithrax (Mithrax) pygmaeus* Bell

*Mithrax pygmaeus* Bell, Proc. Zool. Soc. London, vol. 3, p. 172, 1835; Trans. Zool. Soc. London, vol. 2, p. 55, pl. 11, figs. 3, 3f-h, 1836.

*Mithrax (Mithrax) pygmaeus* Rathbun, Bull. 129, U.S. Nat. Mus., p. 406, pl. 262, figs. 1-4, 1925. Finnegan, Journ. Linn. Soc. London, Zool., vol. 37, no. 255, p. 624, 1931.

*Type locality*.—Panama, 10 fms, sand.

*Type*.—Not extant.

*Range*.—Perlas Islands, Panama (Garman); Galapagos Islands (Crossland).

*Diagnosis*.—Carapace smooth, depressed, broadly oval. Frontal lobes subtruncate, separated by a distinct V. Two rows of lateral marginal spines. Eyes prominent, a minute preocular spine. Basal antennal article broad, marginal teeth 2, flagellum half as long as carapace.

*Material examined*.—None from the Galapagos Islands. Hancock collections contain specimens from Bahia Honda, Panama, to La Plata Island, Ecuador.

#### Subgenus **MITHRACULUS**

#### **Mithrax (Mithraculus) nodosus** Bell

Plate 68, Fig. 1

*Mithrax nodosus* Bell, Proc. Zool. Soc. London, vol. 3, p. 171, 1835 (1836; Trans. Zool. Soc. London, vol. 2, p. 53, pl. 11, figs. 1-lb, 1836.

*Mithrax (Mithraculus) nodosus* Rathbun, Bull. 129, U.S. Nat. Mus., p. 429, pl. 155, and synonymy, 1925. Boone, Zoologica, vol. 8, no. 4, p. 158, fig. 50, 1927. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 625, 1931. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 12, 1933. Hult, Arkiv för Zoologi, Band 30A, no. 5, p. 12, 1938. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Type locality*.—Galapagos Islands.

*Type*.—Not extant.

*Range*.—Galapagos Islands (Bell); Chile (Miers).

*Diagnosis*.—Carapace with smooth, oblique, branchial furrows. Three large anterolateral lobes. Inner margin of cheliped laminated.

*Material examined* (850 specimens from 57 stations).—

11-32. Conway Bay, Indefatigable Island, Jan. 12, 1932, 1 male.

24-33. Gardner Bay, Hood Island, shore, Jan. 24, 1933, 15 males.

27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 20 males, 16 females (6 ovig.).

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 11 males, 20 females (15 ovig.).

33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 11 males, 6 females (4 ovig.).

38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 7 males, 6 females (2 ovig.).

42-33. Opposite Kicker Rock, Chatham Island, shore, Jan. 31, 1933, 3 males, 7 females (5 ovig.).

48-33. Barrington Island, shore, Feb. 2, 1933, 7 males, 9 females (1 ovig.).



- 49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 15 males, 12 females (5 ovig.).
- 52-33. Academy Bay, Indefatigable Island, shore, Feb. 4, 1933, 8 males, 6 females (2 ovig.).
- 56-33. Flamingo Bay, Charles Island, shore, Feb. 5, 1933, 8 males.
- 62-33. Black Bight, Albemarle Island, shore, Feb. 8, 1933, 2 males, 1 female.
- 65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 3 males, 3 females.
- 69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 5 males, 4 females.
- 71-33. James Bay, James Island, shore, Feb. 12, 1933, 16 males, 8 females (2 ovig.).
- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 6 males, 9 females (6 ovig.).
- 76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 34 males, 22 females (15 ovig.).
- 82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 9 males, 6 females.
- 85-33. North Seymour Island, shore, Feb. 18, 1933, 6 males, 1 female.
- 88-33. South Seymour Island, shore, Feb. 19, 1933, 9 males, 2 females.
- 93-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 2 females, 2 young.
- 96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 11 males, 17 females (5 ovig.).
- 98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 7 males, 7 females (5 ovig.).
- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 7 males, 11 females (4 ovig.).
- 153-34. Mangrove Point, Narborough Island, shore, Jan. 14, 1934, 2 females.
- 154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 2 males, 1 female.
- 161-34. Black Beach, Charles Island, 3 fms, Jan. 17, 1934, 2 males, 1 female.
- 163-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 4 males, 8 females.
- 166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 13 males, 8 females.
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 16 males, 19 females.

- 174-34. South Seymour Island, shore, Jan. 22, 1934, 2 males.  
175-34. North Seymour Island, shore, Jan. 22, 1934, 3 males, 6 females.  
179-34. Bartholomew Island, James Island, shore, Jan. 23, 1934, 18 males, 14 females.  
188-34. Cartago Bay, Albemarle Island, shore, Jan. 25, 1934, 1 female.  
199-34. Black Beach, Charles Island, shore, Jan. 30, 1934, 2 males, 8 females (6 ovig.).  
202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 15 males, 13 females.  
306-35. Marchena Island, shore, Dec. 2, 1934, 6 males, 3 females.  
312-35. Black Beach, Charles Island, shore, Dec. 5, 1934, 1 specimen.  
313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 8 males, 6 females (3 ovig.).  
314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 14 males, 22 females (7 ovig.).  
315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 2 males, 1 female.  
333-35. James Bay, James Island, shore, Dec. 11, 1934, 9 males, 7 females (2 ovig.), in poor condition.  
342-35. Bartholomew Island near James Island, shore, Dec. 12, 1934, 1 specimen.  
343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 22 males, 13 females (7 ovig.).  
350-35. South Seymour Island, shore, Dec. 13, 1934, 8 males, 6 females (4 ovig.).  
351-35. South of Black Beach, Charles Island, shore, Dec. 14, 1934, 6 males, 4 females (1 ovig.).  
354-35. Wreck Bay, Chatham Island, shore, Dec. 15, 1934, 1 male.  
358-35. Gardner Bay, Hood Island, shore, Dec. 17, 1934, 8 males, 3 females (1 ovig.).  
359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 23 males, 14 females (10 ovig.).  
782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 5 males, 1 female, 11 young.  
784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 5 males, 4 females (1 ovig.).  
789-38. South Seymour Island, shore, Jan. 19, 1938, 5 males, 12 females (8 ovig.), 5 young.  
796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 18 males, 17 females (16 ovig.), 6 young.

800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 7 males, 3 females (2 ovig.), 1 young.

803-38. Black Beach, Charles Island, shore, Jan. 23, 1938, 2 young.

804-38. Onslow Island, off Charles Island, coral, Jan. 23, 1938, 1 female.

-38. Academy Bay, Indefatigable Island, shore, Jan. 25, 1938, 1 male, Karl Kübler, collector.

*Measurements*.—Largest male: length 30.1 mm, width 38.2 mm, cheliped 57.0 mm, chela 30.9 mm, dactyl 18.6 mm, height of gape 3.6 mm.

*Color in life*.—Uniform purplish brown. Hairs on legs and about antennae yellow, in sunlight yellow green. (Garth)

*Habitat*.—Shore, both in coral and under rocks.

*Depth*.—Although predominately a shore species, *M. nodosus* has been recorded to 12 fms.

*Remarks*.—*M. nodosus* was collected at a greater number of stations than any other species excepting *Teleophrys cristulipes* Stimpson. It is the most abundant spider crab in the Galapagos Islands, being taken both in coral and in ordinary rock turning at low tide. In the *Pocillopora* coral colony it occupies an analogous situation to *M. (Mithraculus) areolata* Lockington of the Bay of Panama, both in relative abundance and as the sole representative of its subgenus. From the experience of the Allan Hancock Expeditions, *M. nodosus* may be considered a true Galapagos endemic species, none having been encountered on the mainland coast as far south as the bays of San Juan and San Nicolas, Peru, well within the limits of the Chilean fauna.

### ***Mithrax (Mithraculus) denticulatus* Bell**

*Mithrax denticulatus* Bell, Proc. Zool. Soc. London, vol. 3, p. 172, 1835; Trans. Zool. Soc. London, vol. 2, p. 54, pl. 11, fig. 2, 1836.

*Mithrax (Mithraculus) denticulatus* Rathbun, Bull. 129, U.S. Nat. Mus., p. 428, pl. 154, figs. 2-3, and synonymy, 1925.

*Type locality*.—Galapagos Islands, under stones.

*Type*.—Not extant.

*Range*.—From Cape San Lucas, Lower California (Xantus), to Ecuador (Nobili); Galapagos Islands (Bell).

*Atlantic analogue*.—*M. (Mithraculus) coryphe* (Herbst).

*Diagnosis*.—Carapace wide, breadth exceeding length by nearly one half. Two acute tubercles and a spine on lateral margin, the latter opposite greatest width of carapace. Inner margin of carpus laminate.

*Material examined*.—None from the Galapagos Islands. The Hancock collections contain a long series of this species ranging from Espiritu Santo Island, Gulf of California, to Manta, Ecuador.

Genus **TELEOPHRYS** Stimpson, 1860**Teleophrys cristulipes** Stimpson

Plate 68, Figs. 5, 6

*Teleophrys cristulipes* Stimpson, Ann. Lyc. Nat. Hist., New York, vol. 7, p. 190 (62), pl. 2, fig. 2, 1860. Rathbun, Proc. Washington Acad. Sci., vol. 4, no. 8, p. 284, 1902; Bull. 129, U.S. Nat. Mus., p. 441, pl. 159, figs. 1, 2, and 7; pl. 262, fig. 7, and synonymy, 1925. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 625, 1931. Crane, Zoologica, vol. 22, no. 3, p. 61, 1937. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Teleophrys diana* Boone, Zoologica, vol. 8, no. 4, p. 162, fig. 52, 1927. Sivertsen, Med. fra det Zool. Mus. Oslo, nr. 38, p. 13, 1933. Hult, Arkiv för Zoologi, Band 30A, no. 5, p. 12, 1938.

*Teleophrys tumidus* Rathbun, Bull. 129, U.S. Nat. Mus., p. 442, part (the Galapagos specimen), 1925. Boone, Zoologica, vol. 8, no. 4, p. 166, 1927.

*Type locality*.—Cape San Lucas, Lower California.

*Type*.—MCZ No. 1226.

*Range*.—From Arena Bank, Gulf of California (*Zaca*), to Gorgona Island, Colombia (Crossland); Galapagos Islands (Hopkins-Stanford Expedition).

*Atlantic analogue*.—*T. pococki* Rathbun.

*Diagnosis*.—Carapace rotund, front low and arching, hepatic region prominent, margins spinulose. Second antennal segment long and cylindrical.

*Material examined* (1,231 specimens from 62 stations).—

27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 30 males, 49 females (38 ovig.).

28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 10 males, 11 females (10 ovig.), 1 young.

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 54 males, 94 females (73 ovig.), 26 young.

31-33. Gardner Bay, Hood Island, 4 fms, Jan. 26, 1933, 1 male, 1 female, 4 young.

33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 7 males, 7 ovig. females.

38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 6 males, 5 ovig. females, 3 young.

46-33. Barrington Island, 4-10 fms, Feb. 2, 1933, 4 males (1 photographed), 3 females (2 ovig.).

- 47-33. Barrington Island, 2 fms, Feb. 2, 1933, 11 males, 6 females (4 ovig.), 8 young.
- 48-33. Barrington Island, shore, Feb. 2, 1933, 1 male.
- 33. Post Office Bay, Charles Island, fish trap, Feb. 5, 1933, 1 male.
- 59-33. Off Cormorant Bay, Charles Island, 13 fms, Feb. 6, 1933, 17 males, 12 females (7 ovig.), 32 young.
- 33. Post Office Bay, Charles Island, "roach" trap on fish trap, Feb. 6, 1933, 1 male.
- 62-33. Black Bight, Albemarle Island, shore, Feb. 8, 1933, 4 males, 1 female.
- 69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 129 males, 131 females (114 ovig.), 4 young, 1 fragment.
- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 4 males, 10 females (8 ovig.).
- 76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 4 males, 9 ovig. females.
- 80-33. Duncan Island, coral, Feb. 15, 1933, 12 males, 12 females (8 ovig.).
- 85-33. North Seymour Island, shore, Feb. 18, 1933, 3 young males.
- 94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 7 males, 8 females (7 ovig.).
- 96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 3 males.
- 97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 7 males, 4 females (3 ovig.).
- 98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 6 males, 6 females (5 ovig.).
- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 1 ovig. female.
- 101a-33. Darwin Bay, Tower Island, coral, Feb. 26, 1933, 4 males, 1 female.
- 152-34. Tagus Cove, Albemarle Island, shore, Jan. 14, 1934, 18 males, 16 females (9 ovig.), 5 young.
- 154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 6 males, 6 ovig. females.
- 161-34. Charles Island, 3 fms, Jan. 17, 1934, 3 males, 5 females (4 ovig.), 2 young.
- 166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 4 males, 12 females (11 ovig.).
- 167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 1 male.
- 168a-34. Academy Bay, Indefatigable Island, coral, Jan. 20, 1934, 2 males, 3 females (2 ovig.).

- 180-34. Sullivan Bay, James Island, 3 fms, Jan. 23, 1934, 2 males, 1 female.
- 189-34. Cartago Bay, Albemarle Island, coral, Jan. 25, 1934, 3 males, 1 young.
- 194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 2 males, 5 females (4 ovig.).
- 199-34. Black Beach, Charles Island, shore, Jan. 30, 1934, 2 males.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 4 males, 12 females (10 ovig.).
- 309-35. Marchena Island, 8 fms, Dec. 3, 1934, 2 specimens.
- 310-35. Marchena Island, 15 fms, Dec. 3, 1934, 1 young female.
- 313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 12 males, 4 females.
- 314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 1 ovig. female.
- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 11 males, 20 females (15 ovig.).
- 322-35. Tagus Cove, Albemarle Island, 10 fms, Dec. 10, 1934, 1 ovig. female.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 11 males, 2 females.
- 340-35. Sullivan Bay, James Island, 8 fms, Dec. 12, 1934, 2 males, 1 female.
- 341-35. Sullivan Bay, James Island, 20 fms, Dec. 12, 1934, 1 male.
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 23 males, 17 females (11 ovig.), 1 young.
- 344-35. Bartholomew Island near James Island, coral, Dec. 12, 1934, 1 male, 3 ovig. females.
- 351-35. South of Black Beach, Charles Island, shore, Dec. 14, 1934, 1 male, 1 female.
- 355-35. Gardner Bay, Hood Island, 12 fms, Dec. 17, 1934, 2 males, 3 females (2 ovig.).
- 356-35. Gardner Bay, Hood Island, 12-15 fms, Dec. 17, 1934, 1 male, 2 ovig. females, 2 young.
- 357-35. Gardner Bay, Hood Island, coral, Dec. 17, 1934, 3 males, 2 females.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 26 males, 19 females (12 ovig.).
- 782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 4 males, 2 ovig. females, 2 young.

- 783-38. Darwin Bay, Tower Island, 40-70 fms, Jan. 16, 1938, 2 ovig. females.
- 784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 7 males, 5 females (3 ovig.).
- 785-38. Darwin Bay, Tower Island, 20-40 fms, Jan. 17, 1938, 2 males, 2 females (1 ovig.).
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 25 males, 18 females (15 ovig.).
- 790-38. "Velero Bay," South Seymour Island, 10-20 fms, Jan. 19, 1938, 1 male.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 17 males, 10 females (3 ovig.).
- 800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 5 males, 4 females (3 ovig.).
- 804-38. Charles Island, coral from Onslow Island crater, Jan. 23, 1938, 5 males, 6 females (5 ovig.), 1 young.
- 811-38. Barrington Island, coral, Jan. 26, 1938, 23 males, 27 females (17 ovig.).
- 811a-38. Barrington Island, *Pavona* coral, Jan. 26, 1938, 3 males, 4 females.

*Measurements*.—Male: length 12.0 mm, width 13.4 mm, cheliped 20.0 mm, chela 10.8 mm.

*Color in life*.—Ground color of carapace a rich dull magenta purple. Lacelike designs on frontal and branchial regions white tinged with red. Ground color of chelipeds and ambulatory legs creamy white; patterns similar to those of carapace but much paler. Crest of hand dark magenta purple. Fingers banded with various shades of orange, tips white. Legs also have blotches of dull yellow. Dactyls golden. (Petersen)

*Habitat*.—Rocky shore or *Pocillopora* coral.

*Depth*.—Shore to 20 fms; exceptionally 40-70 fms.

*Remarks*.—This most abundant spider crab was taken at a greater number of stations than any other Galapagos brachyuran. It is exceeded in number of individual specimens only by two of the Xanthidae, the free-living *Leptodius cooksoni* Miers and the *Pocillopora*-dwelling *Trapezia cymodoce ferruginea* Latreille.

The remarks of Finnegan (1931) concerning the variability of this species and the difference between those collected ashore and those taken in corals are pertinent in the light of the experience of *Velero III* collectors. The larger specimens which stray beyond the protecting branches of the *Pocillopora* are almost invariably smooth legged and lumpy of carapace, while smaller individuals cracked from coral have cristate legs and spinous lateral margins.

Since *Teleophrys tumidus* (Cano) has been twice recorded as from the Galapagos Islands, once by Rathbun (1925, p. 443) and once by Boone (1927, p. 166), it was assumed that specimens of this species would be found among the 1,231 specimens from 62 collecting stations which constitute the *Velero III* Galapagos series of *Teleophrys*. Indeed, in the early years of this study specimens thought to be *tumidus* were taken to the U.S. National Museum for comparison with material determined by Miss Rathbun. Substantial agreement was found between them and the Hopkins-Stanford Expedition specimen (USNM Cat. No. 25678) upon which the first Galapagos record of *tumidus* rests, and on this basis the Hancock series was laboriously separated into "*cristulipes*" and "*tumidus*" fractions, not, however, without an inseparable residue.

The introduction of new material obtained by Hancock Expeditions of 1935 and 1938 in Peru, Cano's type locality, revealed differences between Galapagan and Peruvian specimens which are based upon structural, rather than superficial characters. The Hopkins-Stanford specimen, re-examined in this light, proved to be no more than a particularly cristate *cristulipes*, which was indeed the original Rathbun determination (1902). As a result, the entire Hancock Galapagos series is now referred to *cristulipes*, and doubt is expressed concerning the occurrence of *tumidus* outside of Peruvian waters.

The differences between *cristulipes* and *tumidus*, as represented by Galapagan and Peruvian specimens, respectively, are, in the order of relative importance, (1) the long, cylindrical second free antennal segment of *cristulipes* as compared to the short, broad segment of *tumidus*, (2) the low, arched front of the adult *cristulipes* as compared to the elongated front and closely approximated rostral horns of *tumidus*, (3) the less prominent branchial and more prominent hepatic region of *cristulipes*, giving it a rotund carapace as compared to the more triangular one of *tumidus*, and (4) the absence of a lateral propodal flange in *cristulipes*, although its place is sometimes occupied by a low tubercle in Galapagos specimens. The remaining characters mentioned by Rathbun (1925, p. 442), such as number of anterolateral spines or spinules, proportionate number of tubercles and granules on the carapace, and entire or dentate margin of the basal antennal article, are subject to considerable variation even among adult specimens.

Genus **STENOCIONOPS** (Leach MS.) Desmarest, 1823

KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Stenocionops*

- |  |                       |
|--|-----------------------|
| A <sup>1</sup> 9 median spines and 3 lateral spines . . . .      | <i>S. triangulata</i> |
| A <sup>2</sup> 8 median spines and 4 or 5 lateral spines . . . . | <i>S. ovata</i>       |



**Stenocionops triangulata** (Rathbun)

Plate 67, Figs. 1, 2; Plate 68, Fig. 2

*Pericera triangulata* Rathbun, Proc. U.S. Nat. Mus., vol. 15, p. 246, pl. 32, fig. 1, 1892.

*Stenocionops triangulata* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 577, 1898; Bull. 129, U.S. Nat. Mus., p. 461, pl. 165, fig. 1; pl. 266, fig. 1, 1925.

*Type locality*.—Gulf of California, 29 fms.

*Type*.—USNM No. 16066.

*Range*.—West coast of Lower California, Gulf of California (*Albatross*); Bay of Panama (*Albatross*); 13-51 fms.

*Diagnosis*.—From young specimens: nine median spines and a hepatic spine; 3 marginal spines; rostrum one-sixth carapace length, horns strongly divergent.

*Material examined* (8 specimens from 6 stations).—

143-34. Wenman Island, 100-150 fms, Jan. 11, 1934, 1 large male (photographed, pl. 67).

170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 1 young male (photographed, pl. 68).

317-35. Off Gordon Rocks, Indefatigable Island, 25-30 fms, Dec. 8, 1934, 1 female.

328-35. Tagus Cove, Albemarle Island, 14 fms, Dec. 10, 1934, 1 male.

355-35. Gardner Island, Hood Island, 12 fms, Dec. 17, 1934, 2 specimens.

356-35. Gardner Bay, Hood Island, 12-15 fms, Dec. 17, 1934, 2 males.

*Measurements*.—Largest male: length 40.0 mm, width 32.9 mm, width between preorbital spines 14.8 mm, cheliped 33.5 mm, chela 14.9 mm, rostrum 5.2 mm.

*Habitat*.—Sand and coral, coral and nullipore.

*Depth*.—12-150 fms.

*Remarks*.—From the standpoint of previous records, the reasonable expectation was that *Stenocionops ovata* (Bell) would be found, since its type locality is Galapagos Islands. However, the smaller specimens all fit the description of *S. triangulata* (Rathbun) much better. The measured specimen from Wenman Island, of moderately large size, differs from the young in ways characteristic for the members of the genus. Sufficient difference between it and mainland *S. triangulata* of like size has been noted to suggest the possibility that it may be the adolescent *S. ovata*, which is known only from the description and figure of a young specimen.

In the absence of long series showing growth changes, the writer prefers to refer all Hancock-collected *Stenocionops* from the Galapagos Islands to *S. triangulata*, while calling attention to this discrepancy.

### **Stenocionops ovata (Bell)**

*Pericera ovata* Bell, Proc. Zool. Soc. London, vol. 3, p. 173, 1835; Trans. Zool. Soc. London, vol. 2, p. 60, pl. 12, figs. 5, 5o-q, 1836.

*Stenocionops ovata* Rathbun, Proc. U.S. Nat. Mus., vol. 38, p. 574, 1910; Bull. 129, U.S. Nat. Mus., p. 459, pl. 264, figs. 5-7, 1925.

*Type locality*.—Galapagos Islands.

*Type*.—Not extant.

*Range*.—Known only from the Galapagos Islands (Bell).

*Diagnosis*.—Eight median spines and a hepatic spine; 4 or 5 marginal spines. Rostrum one-fifth carapace length, horns strongly divergent. (From Bell's description.)

*Material examined*.—None, unless the Wenman Island specimen mentioned above should prove to be of this species.

*Remarks*.—See *Remarks* under the preceding *S. triangulata*.

### **Genus MICROPHRYS Milne Edwards, 1851**

#### **KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Microphrys***

- A<sup>1</sup> No flattened, imbricated lobes on the lateral margins of the carapace . . . . . *M. triangulatus*
- A<sup>2</sup> Two flattened, imbricated lobes on the lateral margins of the carapace
  - B<sup>1</sup> Carapace considerably longer than broad; 2 spines at widest part of branchial region . . . . . *M. platysoma*
  - B<sup>2</sup> Carapace little longer than broad, hairy; 4 spines on each branchial region . . . . . *M. aculeatus*

### **Microphrys aculeatus (Bell)**

Plate 63, Fig. 5

*Pisa aculeata* Bell, Proc. Zool. Soc. London, vol. 3, p. 171, 1835 (1836); Trans. Zool. Soc. London, vol. 2, p. 50, pl. 9, fig. 7, 1836.

*Microphrys aculeatus* A. Milne Edwards, Crust. Reg. Mex., p. 63, 1875. Rathbun, Bull. 129, U.S. Nat. Mus., p. 500, pl. 271, fig. 1, and synonymy, 1925. Boone, Zoologica, vol. 8, no. 4, p. 169, fig. 55, 1927. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 13, 1933.

*Type locality*.—Galapagos Islands.

*Type*.—Not extant.

*Range*.—Ecuador (Nobili) ; Peru (Coker) ; Galapagos Islands (Bell).

*Diagnosis*.—Two imbricated, flattened lobes on the side walls of the carapace. Typically 4 anterolateral spines. No lobe on basal antennal article below the acuminate spine.

*Material examined* (14 specimens from 9 stations).—

27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 1 female (photographed).

33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 1 ovig. female.

169-34. Academy Bay, Indefatigable Island, 15-25 fms, Jan. 20, 1934, 1 male.

199-34. Black Beach, Charles Island, shore, Jan. 30, 1934, 1 ovig. female.

313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 1 female.

314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 5 specimens.

315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 1 male, 1 young.

351-35. South of Black Beach, Charles Island, shore, Dec. 14, 1934, 1 male.

789-38. South Seymour Island, shore, Jan. 19, 1938, 1 female.

*Measurements*.—Largest female: length 15.6 mm, width 14.0 mm, cheliped 12.8 mm, chela 6.4 mm.

*Habitat*.—Rocky shore.

*Remarks*.—*M. aculeatus* is a rarely encountered shoreline species. Its discovery by *Velero III* collectors never failed to arouse comment because of the beauty and variety of its bryozoan and coralline encrustations.

Known previously from Tagus Cove and Hood and Charles Islands, its range has been extended to Indefatigable and adjacent South Seymour Islands. *M. aculeatus* is one of the very few species common to the Galapagos Islands and Peru.

### ***Microphrys triangulatus* (Lockington)**

Plate 63, Fig. 6

*Mithraculus triangulatus* Lockington, Proc. California Acad. Sci., vol. 7, p. 73 (11), 1876 (1877).

*Microphrys triangulatus* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 578, 1898; Bull. 129, U.S. Nat. Mus., p. 505, pl. 177, 1925.

*Microphrys branchialis* Rathbun, Proc. Washington Acad. Sci., vol. 4, p. 285, 1902 (part: Galapagos specimens).

*Type locality*.—Gulf of California.

*Type*.—Not extant.

*Range*.—From Agua Verde Bay to Cerralvo Island, Gulf of California (*Albatross*); Galapagos Islands (Rathbun, as *M. branchialis*); shallow water to 10 fms.

*Diagnosis*.—Carapace short, broad, nodose. Basal article of antenna with 3 marginal teeth. Branchial region swollen.

*Material examined* (57 specimens from 12 stations).—

- 148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 1 male, 5 females (4 ovig.).  
149-34. Tagus Cove, Albemarle Island, 20 fms, Jan. 13, 1934, 1 male, 2 females.  
167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 5 males, 4 females, 1 carapace.  
169-34. Academy Bay, Indefatigable Island, 15-25 fms, Jan. 20, 1934, 1 male, 1 female, 1 young.  
177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 4 males (1 photographed), 2 females.  
193-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 27, 1934, 5 males, 6 females, 3 young.  
197-34. Off Post Office Bay, Charles Island, 35-40 fms, Jan. 29, 1934, 1 male.  
341-35. Sullivan Bay, James Island, 20 fms, Dec. 12, 1934, 1 male, 1 female.  
352-35. Wreck Bay, Chatham Island, 35 fms, Dec. 15, 1934, 1 male.  
355-35. Gardner Island, Hood Island, 12 fms, Dec. 17, 1934, 3 males.  
356-35. Gardner Bay, Hood Island, 12-15 fms, Dec. 17, 1934, 4 specimens.  
795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 3 males, 2 females.

*Measurements*.—Largest male: length 14.5 mm, width 13.8 mm, cheliped 25.9 mm, chela 13.2 mm, dactyl 6.2 mm, height of gape 1.8 mm.

*Color in life*.—Carapace carmine, slightly more intense on frontal areas. Antenna banded with same color. Eye dark green. A few white spots scattered on carapace, especially around spines. Cheliped also carmine with a few white spots. Fingers carmine, white banded. Ambulatory legs also carmine, banded with white. (Petersen)

*Habitat*.—Rock, frequently with red algae attached; rock and sand; one record of coral, nullipore, and rock.

*Depth*.—Shoal water to 40 fms.

*Sex variation*.—Adult male has well-developed chelipeds, broad fingers, wide gape.

*Remarks*.—*Velero III* records considerably extend the range of this species within the insular group, it being known previously from but two specimens taken at Tagus Cove, Albemarle Island, by the Hopkins-Stanford Expedition. *M. triangulatus* is the commonly dredged *Microphrys* of the Galapagos Islands, *M. aculeatus* the shore-dwelling species.

The known depth is hereby increased from 10 to 40 fms.

### ***Microphrys platysoma* (Stimpson)**

Plate 68, Figs. 3, 4

*Milnia platysoma* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 180, 1860.

*Microphrys platysoma* A. Milne Edwards, Crust. Reg. Mex., p. 62, 1875. Rathbun, Bull. 129, U.S. Nat. Mus., p. 497, pl. 176, figs. 1 and 2, and synonymy, 1925. Crane, Zoologica, vol. 22, no. 3, p. 63, 1937. *Not* Rathbun, Proc. Washington Acad. Sci., vol. 4, no. 8, p. 285, 1902.

*Type locality*.—Cape San Lucas, Lower California.

*Type*.—Not extant.

*Range*.—From Patos Island, Gulf of California (California Academy of Sciences), to Panama (Meek and Hildebrand); Salinas, Ecuador (Schmitt, unpublished); low tide to  $4\frac{1}{2}$  fms.

*Atlantic analogue*.—*M. antillensis* Rathbun.

*Diagnosis*.—Two imbricated, flattened lobes on the sides of the carapace. Two branchial spines on each side in the same transverse line. A lobe on the basal antennal article below the single spine.

*Material examined*.—

783-38. Darwin Bay, Tower Island, 40-70 fms, Jan. 16, 1938, 2 young (1 photographed).

*Measurements*.—Young specimen: length 6.3 mm, width 5.0 mm.

*Habitat*.—White sand and rock.

*Depth*.—Low tide to 70 fms.

*Remarks*.—In view of the fact that *M. aculeatus* is invariably a shore-collected species, Miss Rathbun (1925) was undoubtedly right in referring the Hopkins-Stanford "*platysoma*" to that species, since it was collected on a reef north of Tagus Hill, a shore locality. The Hancock specimens were dredged in 40-70 fms, and, although not mature, show the two imbricated lobes clearly. Because of the depth at which they were obtained, they could scarcely be *aculeatus*, and the only other Pacific *Microphrys* with two imbricated lobes is *platysoma*.

Genus **TYCHE** Bell, 1835**Tyche lamellifrons** Bell

Plate 54, Figs. 1-6

*Tyche lamellifrons* Bell, Proc. Zool. Soc. London, vol. 3, p. 173, 1835 (1836); Trans. Zool. Soc. London, vol. 2, p. 58, pl. 12, figs. 3, 3f-j, 1836. Rathbun, Bull. 129, U.S. Nat. Mus., p. 508, pl. 273, figs. 1-6, and synonymy, 1925. Crane, Zoologica, vol. 22, no. 3, p. 64, 1937.

*Type locality*.—Panama.

*Type*.—In Brit. Mus.

*Range*.—Gulf of California (*Albatross*) to Panama (Bell); to a depth of 29 fms (Crane).

*Atlantic analogue*.—*T. emarginata* White.

*Diagnosis*.—Preorbital horns divergent, exceeding rostral horns. Posterior margin of carapace faintly trilobate. Orbits concealing eyestalks to extremities.

*Material examined* (6 specimens from 6 stations).—

69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 1 female (illustrated).

167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 1 male (illustrated in part).

311-35. Marchena Island, 20 fms, Dec. 3, 1934, 1 young.

343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 1 male.

355-35. West of Gardner Island, Hood Island, 12 fms, Dec. 17, 1934, 1 male.

784-35. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 1 young.

*Measurements*.—Largest specimen, female: length 29.0 mm, width 18.0 mm; male: length 24.2 mm, width 15.0 mm, cheliped 19.0 mm, chela 9.1 mm.

*Color in life*.—A young specimen: carapace uniform sudan brown. Eyestalk amber, eye buff yellow. Cheliped same as carapace but hand a tone lighter, color fading gradually to very pale tips. Ambulatory legs lighter than carapace; nail of dactyl clear pale amber. (Petersen)

*Habitat*.—Sandy bottom (Bell) with weed (Crane). *Velero III* specimens were all taken either on rocky shore, or with tangles, indicating rocky bottom.

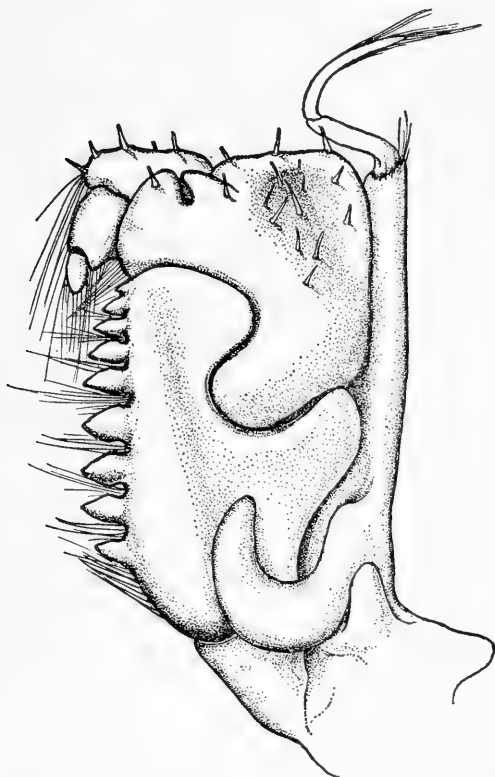
*Depth*.—Shore to 29 fms.

*Remarks*.—An adult female, measuring 29 mm in length by 18 mm in width, appears to be the largest specimen on record. The preorbital horns exceed the rostral and are strongly divergent, as in the Atlantic species, *T. emarginata* White, thus differing from the diagnostic char-

acters given by Rathbun (1925, p. 509) and requiring supplementary description which can best be given by a point-by-point comparison with the Atlantic species.

In comparing the above-mentioned female of *Tyche lamellifrons* with a female specimen of *T. emarginata* loaned by the U.S. National Museum (Cat. No. 46770) and a male with loaned male No. 46772, the following differences became apparent:

1. The rostral horns are parallel in *lamellifrons* and are almost joined half way to their extremities by protuberances which almost, if not actually, touch one another on the midline. The rostral horns of *emarginata*, on the other hand, are strongly divergent from their bases and have no suggestion of such protuberances.



TEXT FIG. 1

Left outer maxilliped of *Tyche emarginata* White

2. The orbital horns of both species are divergent, although less strongly so in *T. lamellifrons*, and in both they extend beyond the rostral horns. Lines drawn through their long axes would cross at the gastric level in *emarginata* and at the cardiac level in *lamellifrons* because of the more divergent angle taken by them in the former species.

3. The posterior margin of the carapace of *lamellifrons* is faintly trilobate, that of *emarginata* strongly bilobate and lamellate.

4. Because of these posterior lobes and the greater length of the rostral and orbital horns, the proportion of length to breadth of carapace appears greater in *emarginata* than in *lamellifrons*, particularly in adult male specimens.

5. The ambulatory legs of *lamellifrons* are shorter and stouter than those of *emarginata*.

6. The exopodite of the third maxilliped of *emarginata* has a basal protuberance which recurves to cover the base of the ischium. The merus inserts deeply into the outer distal portion of the ischium by a similar, but less developed tongue or flange. The inner margin of the ischium is strongly dentate. (See text fig. 1.)

In *lamellifrons* the basal projection of the exopodite does not recurve to cover the base of the ischium, the merus does not insert so deeply into the ischium, the inner margin of which is nondentate.

7. The first free antennal segment in *lamellifrons* is flattened, in *emarginata* it is cylindrical.

8. The sternal plastron of *emarginata* is deeply indented and there are 2 strong tubercles, one on either side of the base of the last abdominal segment in the male. The sternum of *lamellifrons* is flat with but a slight tubercle opposite the last abdominal segment.

*T. lamellifrons* is now recorded from the Galapagos Islands.



Family ***PARTHENOPIDAE***Subfamily ***PARTHENOPINAE***Genus ***PARTHENOPE*** Weber, 1795KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Parthenope*

- A<sup>1</sup> Chelipeds more than twice as long as carapace; carapace broadly triangular, sides rounded . . . (Subgenus *Platylambrus*)
- B<sup>1</sup> Three large tubercles on posterior margin, one of which is median . . . . . *P. (Platylambrus) exilipes*
- A<sup>2</sup> Chelipeds less than twice as long as carapace . . . . .
- . . . . . (Subgenus *Pseudolambrus*)
- B<sup>1</sup> Anterolateral margins without an abrupt angle; upper border of chela with 8 or 9 strong teeth *P. (Pseudolambrus) triangularis*

Subgenus ***PLATYLAMBRUS*** Stimpson, 1871***Parthenope (Platylambrus) exilipes*** (Rathbun)

Plate 69, Fig. 2

*Lambrus (Parthenolambrus) exilipes* Rathbun, Proc. U.S. Nat. Mus., vol. 16, p. 234, 1893.

*Lambrus exilipes* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 581, 1898.

*Parthenope (Platylambrus) exilipes* Rathbun, Bull. 129, U.S. Nat. Mus., p. 523, pls. 184 and 185; pl. 277, figs. 1-2, and synonymy, 1925. Crane, Zoologica, vol. 22, no. 3, p. 64, 1937.

*Type locality*.—Off San Domingo Point, Lower California.

*Type*.—USNM No. 17365.

*Range*.—West coast of Lower California (*Albatross*) to Panama (*Albatross*); Galapagos Islands (*Albatross*).

*Atlantic analogue*.—*P. (Platylambrus) pourtalesii* (Stimpson).

*Diagnosis*.—Carapace one-third broader than long, branchial regions expanded and inflated, a median tubercle on posterior margin. Lateral teeth short and blunt.

*Material examined* (100 specimens from 12 stations).—

55-33. Lat. 1° 03' 30" S, Long. 90° 17' 30" W, 60 fms, Feb. 5, 1933, 3 males, 3 young.

170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 1 female.

171-34. East of Wreck Bay, Chatham Island, 35-40 fms, Jan. 21, 1934, 2 females, 1 young.

185-34. Cartago Bay, Albemarle Island, 32 fms, Jan. 25, 1934, fragments.

- 190-34. Lat.  $0^{\circ} 55' S$ , Long.  $90^{\circ} 30' W$ , 58-60 fms, Jan. 26, 1934, 4 females (1 ovig.) (photographed), 14 young.
- 201-34. Off Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 2 specimens.
- 318-35. Off Gordon Rocks, Indefatigable Island, 45 fms, Dec. 8, 1934, 1 female.
- 346-35. South Seymour Island, 55 fms, Dec. 13, 1934, 1 male, 1 female.
- 792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 38 young.
- 810-38. (D-2) Barrington Island, 73 fms, Jan. 26, 1938, 1 male, 2 females.
- 814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 5 males, 2 females, 17 young.
- 816-38. North of Hood Island, 50-100 fms, Jan. 29, 1938, 1 male, 1 female, 1 young.

*Measurements*.—Largest female: length 16.3 mm, width 19.5 mm, cheliped 42 mm, chela 18.9 mm.

*Habitat*.—Sand, sand and mud, sand and shell, sand and coral; mud and shell.

*Depth*.—20-100 fms (one shore record).

*Remarks*.—*P. exilipes* is the most abundant of Galapagos parthenopids, occurring throughout the archipelago at medium depth, 20-100 fms.

#### Subgenus **PSEUDOLAMBRUS** Paulson, 1875

#### **Parthenope (Pseudolambrus) triangula** (Stimpson)

Plate 69, Fig. 1

*Lambrus triangulus* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 201, 1860.

*Parthenope (Pseudolambrus) triangula* Rathbun, Bull. 129, U.S. Nat. Mus., p. 528, pl. 278, figs. 1-3. Crane, Zoologica, vol. 22, no. 3, p. 65, pl. 5, fig. 18, 1937.

*Type locality*.—Cape San Lucas, Lower California.

*Type*.—Not extant.

*Range*.—Known only from the type locality, Cape San Lucas, and from San Lucas Bay (*Zaca*).

*Diagnosis*.—Chelipeds less than twice as long as carapace. Carapace an equilateral triangle, definitely widest at posterolateral angle; anterolateral margin nearly straight, multidenticulate; 8 or 9 strong teeth on upper margin of chela.

*Material examined* (44 specimens from 17 stations).—

- 25-33. Gardner Bay, Hood Island, 2 fms, Jan. 24, 1933, 1 male.  
59-33. Off Cormorant Bay, Charles Island, 13 fms, Feb. 6, 1933, 1 female.  
87-33. South Seymour Island, 15 fms, Feb. 19, 1933, portion of left cheliped.  
173-34. South Seymour Island, 5 fms, Jan. 22, 1934, 2 males.  
177-34. Sullivan Bay, James Island, 20 fms, Jan. 23, 1934, 1 male (photographed).  
187-34. Cartago Bay, Albemarle Island, 8-10 fms, Jan. 25, 1934, 1 male.  
204-34. Gardner Bay, Hood Island, 30 fms, Jan. 31, 1934, 1 male.  
310-35. Marchena Island, 15 fms, Dec. 3, 1934, 1 male.  
339-35. Sullivan Bay, James Island, 10 fms, Dec. 12, 1934, 1 young male.  
341-35. Sullivan Bay, James Island, 20 fms, Dec. 12, 1934, 1 male.  
355-35. Gardner Bay, Hood Island, 12 fms, Dec. 17, 1934, 1 male, 1 female.  
356-35. Gardner Bay, Hood Island, 12-15 fms, Dec. 17, 1934, 1 male.  
360-35. Gardner Bay, Hood Island, 3 fms, Dec. 19, 1934, 3 young.  
361-35. Gardner Bay, Hood Island, 12 fms, Dec. 19, 1934, 1 male.  
782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 1 young.  
783-38. Darwin Bay, Tower Island, 40-70 fms, Jan. 16, 1938, 5 males, 3 females.  
785-38. Darwin Bay, Tower Island, 20-40 fms, Jan. 17, 1938, 7 males, 8 females, 2 young.

*Measurements*.—Largest male: length 16.3 mm, width 20.6 mm, cheliped 34.0 mm, chela 14.7 mm, dactyl 8.1 mm.

*Color in life*.—Ground color of carapace pale dull yellow overcast with numerous tiny orange blotches among which appear tiny dark carmine spots. A broad band of dark tourmaline pink on raised branchial area. Raised portion on gastric, cardiac, and intestinal areas with broad bands of pale orange yellow. Eye light nickel green. Ground color of cheliped same as carapace. A large orange-red spot on distal end of merus. Carpus darker than merus or hand, the teeth of which are white. Fingers deep orange, blending into rich brownish purple to dull yellow at tips. Ambulatory legs pale dull yellow with bands of vinaceous purple. Dactyls pale yellowish white. (Petersen)

*Habitat*.—Sand, sand and rock, sand and coral; rock.

*Depth*.—2-70 fms.

*Remarks.*—A specimen sent Miss Rathbun in 1933 was returned with the notation "*Parthenope*, n. sp., nr. *P. guerini* (Brito Capello)." Examination of a specimen of the latter (USNM No. 55783) in 1937 revealed that the Galapagos specimens were not even of the same subgenus, their shorter chelipeds placing them in *Pseudolambrus* Paulson (1875) rather than in *Platylambrus* Stimpson (1871). By this time most of the Hancock mainland material had been identified, Stimpson's *P. triangula* rediscovered, both in the north and in adjacent Ecuadorean waters (unpublished records), and it was realized that the Galapagos specimens were referable to this species.

*P. triangula* is now recorded from the Galapagos Islands.

### Genus **DALDORFIA** Rathbun, 1904

*Daldorfia* Rathbun, Proc. Biol. Soc. Washington, vol. 17, p. 171, 1904.

The name *Daldorfia* was proposed to replace *Lambrus* Leach, retired as a synonym of *Parthenope* Weber. Besides the type species, *D. horrida* (Linnaeus), the genus now contains *D. semicircularis* (Flipse) and the following *D. garthi* Glassell.

#### ***Daldorfia garthi* Glassell**

Plate 55, Figs. 1-11

*Parthenope (Pseudolambrus) excavata* Boone, Zoologica, vol. 8, no. 4, p. 173, fig. 58, 1927.

*Daldorfia garthi* Glassell, Allan Hancock Pac. Exped., vol. 5, no. 3, p. 67, pl. 17, figs. 1-11, 1940.

*Type locality.*—Sullivan Bay, James Island, Galapagos Islands.

*Type.*—AHF no. 3811.

*Range.*—Cape San Lucas, Lower California, to Colombia (*Velero III*); Galapagos Islands (*Velero III*).

*Diagnosis.*—Carapace triangular, deeply eroded, anterolateral margins spined, posterolateral margin straight. Meri of ambulatory legs with overlapping teeth, propodi with 2 denticles on lower margin. Chelipeds massive, unequal. A semiovoid sternal pit.

*Material examined* (11 specimens from 4 stations).—

312-35. Black Beach, Charles Island, shore, Dec. 5, 1934, 1 female.

313-35. Black Beach, Charles Island, shore, Dec. 5, 1934, 1 female.

343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 1 male.

796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 1 male (holotype, AHF no. 3811); also 6 males and one female (paratypes).

*Measurements.*—Male holotype: length 31 mm, width 47 mm, merus of cheliped 29 mm, carpus 13 mm, manus including pollex 46 mm.

*Habitat*.—Under rocks at extreme low tide.

*Depth*.—Shore.

*Remarks*.—This large and striking species, the only Pacific parthenopid commonly encountered at low tide, has suffered at the hands of taxonomists, having been referred to *Parthenope* (*Pseudolambrus*) *excavata* (Stimpson) by Boone (1927) and to *Thyrolambrus erosus* Rathbun (1898) by the author of that species, although not in print, in an identification made in 1933. While at the National Museum in 1939, the writer compared for Mr. Glassell a specimen from Cape San Lucas with the type of *T. erosus* (USNM No. 21577) and reported that the San Lucas specimen was undoubtedly a new species. The Hancock material was turned over for description to Mr. Glassell, who selected his types from among James Island, Galapagos, material.

*Daldorfa* is an Indo-Pacific genus reaching the Hawaiian Islands, where it is represented by *D. horrida* (Linnaeus), but not known to occur heretofore in the Americas.

Genus **SOLENOLAMBRUS** Stimpson, 1871

**Solenolambrus arcuatus** Stimpson

Plate 69, Figs. 3, 4

*Solenolambrus arcuatus* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 10, p. 101 (128), 1871. Rathbun, Bull. 129, U.S. Nat. Mus., p. 538, and synonymy, 1925. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 625, 1931.

*Type locality*.—Panama.

*Type*.—Not extant.

*Range*.—Panama (Stimpson, Finnegan).

*Atlantic analogue*.—*S. typicus* Stimpson.

*Material examined* (5 specimens from 4 stations).—

55-33. Lat. 1° 03' 30" S, Long. 90° 17' 30" W, 60 fms, Feb. 5, 1933, 1 young.

204-34. Gardner Bay, Hood Island, 30 fms, Jan. 31, 1934, 2 young females.

322-35. Tagus Cove, Albemarle Island, 10 fms, Dec. 10, 1934, 1 male.

328-35. Tagus Cove, Albemarle Island, 14 fms, Dec. 10, 1934, 1 male (photographed).

*Measurements*.—Largest male: length 11.5 mm, width 14.4 mm, cheliped 24.7 mm, chela, 12.2 mm.

*Color in life*.—Ground color pale olive buff to white. Rostrum cadmium orange, gastric region olive gray with white spots and streaks showing through. Anterolateral margins white. Other areas overcast with

patterns of deep livid brown and dark vinaceous purple. Ambulatory legs white with tone of cadmium yellow and touches of vinaceous purple on upper surfaces of merus, carpus, and propodus; tip of dactyl yellow. Cheliped like carapace with patterns of vinaceous purple in broad bands; two on merus and one on chela. Fingers white. (Petersen)

*Habitat*.—Sand.

*Depth*.—10-60 fms.

*Remarks*.—*S. arcuatus* is one of very few species of which no specimen was available for illustration in the Rathbun monograph (1925). Known previously only from Panamanian specimens, it is now recorded from the Galapagos Islands in several widely separated localities.

Genus **MESORHOEA** Stimpson, 1871

**Mesorhoea bellii** (A. Milne Edwards)

Plate 69, Figs. 5, 6

*Solenolambrus bellii* A. Milne Edwards, Crust. Reg. Mex., p. 163, pl. 29, figs. 6-6d, 1878.

*Mesorhoea bellii* Rathbun, Bull. 129, U.S. Nat. Mus., p. 548, pl. 201; pl. 280, figs. 1-4, and synonymy, 1925. Crane, Zoologica, vol. 22, no. 3, p. 65, 1937.

*Type locality*.—Mexico.

*Type*.—In Paris Mus.

*Range*.—From Abreojos Point, Lower California (*Albatross*), to Panama Bay, including the Gulf of California; 9 to 71 fms.

*Atlantic analogue*.—*M. sexspinosa* Stimpson.

*Material examined* (8 specimens from 5 stations).—

55-33. Lat.  $1^{\circ} 03' 30''$  S, Long.  $90^{\circ} 17' 30''$  W, 60 fms, Feb. 5, 1933, 1 young female.

190-34. Lat.  $0^{\circ} 55'$  S, Long.  $90^{\circ} 30'$  W, 58-60 fms, Jan. 26, 1934, 1 young female.

792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 2 males, 1 female.

810-38. (D-2) Barrington Island, 73 fms, Jan. 26, 1938, 1 young.

814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 1 male (photographed), 1 female.

*Measurements*.—Largest specimen: length 11.0 mm, width 14.6 mm, cheliped 21.0 mm, chela 8.7 mm.

*Color in life*.—Ground color of carapace pale ochraceous buff. Frontal areas a tone darker and a little more yellow; pattern on frontal area deep olive buff. Chela pale ochraceous buff, fading on fingers to white tips.

Numerous tiny and larger red spots appear in groups and scattered on carapace, but none on ambulatory legs, which are nearly white; merus banded with chrome orange, nail of dactyl yellow. (Petersen)

*Habitat*.—Sand, sand and shell, sand and nullipore, sand and coral.

*Depth*.—9-80 fms.

*Remarks*.—*M. bellii* is now recorded from the Galapagos Islands.

Genus **AETHRA** Leach, 1816  
**Aethra scruposa scutata** Smith  
Plate 70, Figs. 1, 2

*Aethra scutata* Smith, Amer. Journ. Sci., ser. 2, vol. 48, p. 120, 1869.

*Oethra scruposa*, var. *scutata* A. Milne Edwards, Crust. Reg. Mex., p. 170, pl. 31, figs. 2-2e, 1878.

*Aethra scruposa scutata* Rathbun, Bull. 129, U.S. Nat. Mus., p. 552, pl. 195, and synonymy, 1925.

*Type locality*.—La Paz, Lower California.

*Type*.—In Yale Univ. Mus.

*Range*.—From La Paz, Lower California (Smith), to Mazatlan (A. Milne Edwards).

*Diagnosis*.—Carapace transversely elliptical, margins thin, expanded to conceal legs and cut by closed fissures into numerous broad teeth. Margins of chelipeds and ambulatory legs produced, dentate.

*Material examined* (4 specimens from 2 stations).—

28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 1 male.

796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 1 male, 2 females (1 photographed).

*Measurements*.—Largest specimen, male: length 63.0 mm, width 97.1 mm, cheliped (rigid) coxa to elbow 34 mm, elbow to tip of dactyl 42 mm, chela 36.3 mm, dactyl 23.4 mm.

*Color in life*.—The appearance of the carapace is that of a much eroded rock encrusted with coralline algae.

*Habitat*.—Under rocks at low tide.

*Depth*.—Strictly a shoreline species.

*Remarks*.—For five years a single, very large male from Hood Island was the only representative of this species in Hancock collections, despite repeated collecting over the same territory. Then, in 1938, an exceptional tide at Sullivan Bay gave *Velero III* collectors three more specimens, including females, along with more of the equally desirable *Glyptoxanthus hancocki* Garth (1939) and *Daldorfia garthi* Glassell (1940), all three of which occupy extremely low tide levels.

*A. scruposa scutata* is now recorded from the Galapagos Islands.

Superfamily **BRACHYRHYNCHA**Family **PORTUNIDAE**Subfamily **THALAMITINAE**Genus **PORTUNUS** Weber, 1795KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Portunus*

- A<sup>1</sup> A spine at posterior angles of the carapace; merus of swimming leg unarmed . . . . . *P. (Achelous) tuberculatus*
- A<sup>2</sup> No spine at posterior angles of the carapace; a spine at postero-distal angle of merus of swimming leg
- B<sup>1</sup> Carapace with numerous areolations; lateral spine as long as width of 3 adjacent teeth . . . . *P. (Achelous) stanfordi*
- B<sup>2</sup> Carapace flat and smooth; lateral spine no longer than largest of anterolateral spines . . . *P. (Achelous) angustus*

Subgenus **ACHELOUS** de Haan**Portunus (Achelous) stanfordi** Rathbun

Plate 71, Fig. 1

*Portunus (Achelous) brevimanus* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 593, 1898; vol. 38, p. 578, 1910 (part: the Galapagos specimens).

*Portunus (Achelous) stanfordi* Rathbun, Proc. Washington Acad. Sci., vol. 4, p. 282, pl. 12, fig. 11, 1902; Bull. 152, U.S. Nat. Mus., p. 69, pl. 31, text fig. 11, 1930. Boone, Zoologica, vol. 8, no. 4, p. 178, fig. 60, 1927.

*Type locality*.—Tagus Cove, Albemarle Island.

*Type*.—USNM No. 24833.

*Range*.—Tagus Cove, Albemarle Island (Hopkins-Stanford Expedition), and Hood Island (*Arcturus*); known only from the Galapagos Islands.

*Diagnosis*.—Carapace with numerous lumpy elevations. Lateral spine almost transverse, its length equal to the width of the two adjacent teeth. A spine at the posterodistal angle of the merus of the fourth leg.

*Material examined* (234 specimens from 40 stations).—

9-32. Tagus Cove, Albemarle Island, Jan. 6, 1932, surface at light, 1 female.

55-33. Lat. 1° 03' 30" S, Long. 90° 17' 30" W, 60 fms, Feb. 5, 1933, 1 young male.

78-33. Conway Bay, Indefatigable Island, surface at light, Feb. 15, 1933, 2 males, 2 females.



- 84-33. South Seymour Island, 13 fms, Feb. 18, 1933, 1 specimen and fragments.
- 143-34. Wenman Island, 100-150 fms, Jan. 11, 1934, 1 female.
- 147-34. Tagus Cove, Albemarle Island, 30 fms, Jan. 13, 1934, 2 males, 4 ovig. females.
- 148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 1 male, 3 young.
- 149-34. Tagus Cove, Albemarle Island, 20 fms, Jan. 13, 1934, 2 young females, 1 fragment.
- 155-34. Tagus Cove, Albemarle Island, 50-60 fms, Jan. 15, 1934, 1 male, 1 female.
- 157-34. Tagus Cove, Albemarle Island, 10-18 fms, Jan. 15, 1934, 4 males, 2 females, 2 young.
- 170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 30 young.
- 171-34. East of Wreck Bay, Chatham Island, 35-40 fms, Jan. 21, 1934, 8 young.
- 173-34. South Seymour Island, 5 fms, Jan. 22, 1934, 4 males, 2 females. Also 1 atypical specimen doubtfully referable to the above.
- 177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 1 young.
- 182-34. James Bay, James Island, 30 fms, Jan. 24, 1934, 3 young, 1 carapace.
- 185-34. Cartago Bay, Albemarle Island, 32 fms, Jan. 25, 1934, 2 young.
- 186-34. Cartago Bay, Albemarle Island, 32 fms, Jan. 25, 1934, 2 young and fragments.
- 190-34. Lat.  $0^{\circ} 55' S$ , Long.  $90^{\circ} 30' W$ , 58-60 fms, Jan. 26, 1934, 18 young.
- 195-34. North of Charles Island, 70-80 fms, Jan. 29, 1934, 1 large male, 2 ovig. females.
- 197-34. Off Post Office Bay, Charles Island, 35-40 fms, Jan. 29, 1934, 7 young.
- 198-34. NW of Post Office Bay, Charles Island, 55-65 fms, Jan. 29, 1934, 4 young.
- 201-34. Off Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 1 large male, 5 young.
- 204-34. Gardner Bay, Hood Island, 30 fms, Jan. 31, 1934, 5 young.
- 318-35. Off Gordon Rocks, Indefatigable Island, 45 fms, Dec. 8, 1934, 4 young.
- 322-35. Tagus Cove, Albemarle Island, 10 fms, Dec. 10, 1934, 1 male, 1 female, 8 young.

- 324-35. Tagus Cove, Albemarle Island, 45 fms, Dec. 10, 1934, 1 male, 2 females (1 ovig.), 6 young.
- 326-35. Tagus Cove, Albemarle Island, 15 fms, Dec. 10, 1934, 2 males (1 photographed), 1 female, 6 young.
- 327-35. Tagus Cove, Albemarle Island, 12 fms, Dec. 10, 1934, 1 male, 15 young.
- 328-35. Tagus Cove, Albemarle Island, 14 fms, Dec. 10, 1934, 2 males, 8 young.
- 330-35. Tagus Cove, Albemarle Island, 12 fms, Dec. 10, 1934, 4 young.
- 345-35. Between Daphne and South Seymour Islands, 30 fms, Dec. 13, 1934, 1 young.
- 346-35. Between South Seymour and Daphne Islands, 55 fms, Dec. 13, 1934, 5 young.
- 347-35. South Seymour Island, 3 fms, Dec. 13, 1934, 3 young.
- 362-35. Gardner Bay, Hood Island, 20 fms, Dec. 19, 1934, 17 young.
- 790-38. South Seymour Island, 10-20 fms, Jan. 19, 1938, 1 young.
- 792-38. Between South Seymour and Daphne Islands, 70-80 fms, Jan. 20, 1938, 1 male, 1 female, 4 young.
- 795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 1 male, 1 female.
- 813-38. Gardner Bay, Hood Island, surface at light, Jan. 27, 1938, 1 male.
- 814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 4 males, 4 females, 7 young.
- 816-38. North of Hood Island, 50-100 fms, Jan. 29, 1938, 2 males, 1 female, 1 young.

*Measurements.*—Large female: length 26.7 mm, width 45.6 mm, cheliped 60.0 mm, chela 27.8 mm, dactyl 14.6 mm; largest male: length 28.0 mm, width 48.4 mm, cheliped 78.0 mm, chela 35.0 mm, dactyl 16.7 mm.

*Color in life.*—Ground color of carapace pale olive buff. Granules on all raised areas cadmium orange to bright red and carmine on edges. Anterolateral teeth with a cluster of orange-yellow dots at bases; lateral tooth edged with carmine. Cheliped with carmine on large spines. Fingers carmine, banded with white. Ambulatory legs with delicate pale lavender tint becoming more intense distally. Merus of swimming leg faintly tinted with yellow. (Petersen)

*Habitat.*—The bottom, where noted, is sandy in every case but one which is marked "very rocky" and one marked "gray mud and shell." Red algae were frequently present in the haul.

*Depth*.—5-150 fms; also pelagic at night.

*Remarks*.—All were dredged specimens except four which came to the gangway light. *P. (A.) stanfordi* may be distinguished from *P. (A.) angustus* Rathbun (1898) by the rough carapace and the strong lateral spine, both unmistakable in even the smallest specimens. Hancock specimens have been compared with the type (USNM No. 24833).

The range of the species has been extended to include the northernmost island, Wenman, and the known depth increased to 150 fms.

### **Portunus (Achelous) angustus Rathbun**

Plate 71, Figs. 3, 4

*Portunus (Achelous) angustus* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 594, pl. 44, fig. 2, 1898; Proc. Washington Acad. Sci., vol. 4, p. 282, 1902; Bull. 152, U.S. Nat. Mus., p. 70, pl. 32, 1930. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 629, 1931.

*Type locality*.—Off Hood Island, Galapagos Islands, 20 fms.

*Type*.—USNM No. 21587.

*Range*.—Hood Island (*Albatross*) and Tagus Cove, Albemarle Island (Hopkins-Stanford Expedition); known only from the Galapagos Islands.

*Atlantic analogue*.—*P. ordwayi* (Stimpson).

*Diagnosis*.—Carapace flat and smooth, except for low transverse granulate ridges. Lateral spine short, no larger than largest of antero-lateral spines. A spine at the posterodistal angle of the merus of leg 4. Anterolateral spines alternately large and small, as in *Cronius*.

*Material examined* (128 specimens from 31 stations).—

66-33. Tagus Cove, Albemarle Island, 10-20 fms, Feb. 9, 1933, fragments.

86-33. South Seymour Island, surface at light, Feb. 18, 1933, 2 young.

87-33. South Seymour Island, 15 fms, Feb. 19, 1933, 2 young.

149-34. Tagus Cove, Albemarle Island, 20 fms, Jan. 13, 1934, 1 male.

157-34. Tagus Cove, Albemarle Island, 10-18 fms, Jan. 15, 1934, 2 males.

167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 5 young.

168a-34. Academy Bay, Indefatigable Island, coral, Jan. 20, 1934, 1 young.

169-34. Academy Bay, Indefatigable Island, 15-25 fms, Jan. 20, 1934, 11 young.

- 173-34. South Seymour Island, 5 fms, Jan. 22, 1934, 1 young.  
177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 2 males, 2 females (1 ovig.) (photographed), 9 young.  
193-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 27, 1934, 17 young.  
196-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 29, 1934, chela.  
197-34. Off Post Office Bay, Charles Island, 35-40 fms, Jan. 29, 1934, 3 young.  
204-34. Gardner Bay, Hood Island, 30 fms, Jan. 31, 1934, 28 young.  
326-35. Tagus Cove, Albemarle Island, 15 fms, Dec. 10, 1934, 2 females, 1 young.  
327-35. Tagus Cove, Albemarle Island, 12 fms, Dec. 10, 1934, 1 female.  
328-35. Tagus Cove, Albemarle Island, 14 fms, Dec. 10, 1934, 1 male.  
330-35. Tagus Cove, Albemarle Island, 12 fms, Dec. 10, 1934, 1 male.  
336-35. Sullivan Bay, James Island, 20 fms, Dec. 12, 1934, 1 male, 2 females, 2 young.  
339-35. Sullivan Bay, James Island, 10 fms, Dec. 12, 1934, 1 male, 1 female.  
340-35. Sullivan Bay, James Island, 8 fms, Dec. 12, 1934, 1 young and fragment.  
341-35. Sullivan Bay, James Island, 20 fms, Dec. 12, 1934, 5 females (1 ovig.), 3 young.  
347-35. South Seymour Island, 3 fms, Dec. 13, 1934, 1 young.  
348-35. South Seymour Island, 15 fms, Dec. 13, 1934, 1 young.  
361-35. Gardner Bay, Hood Island, 12 fms, Dec. 19, 1934, 3 males.  
362-35. Gardner Bay, Hood Island, 20 fms, Dec. 19, 1934, 2 males, 1 young.  
788-38. SE of Daphne Major Island, 55 fms, Jan. 19, 1938, 1 male.  
795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 3 young.  
799-38. Cartago Bay, Albemarle Island, 15-18 fms, Jan. 22, 1938, 1 female.  
807-38. Academy Bay, Indefatigable Island, 10-25 fms, Jan. 24, 1938, 2 males, 2 young.  
809-38. Academy Bay, Indefatigable Island, surface at light, Jan. 25, 1938, 1 female.
- Measurements.*—Largest male: length 24.1 mm, width 34.6 mm, cheliped 46 mm, chela 21.6 mm, dactyl 12.8 mm.
- Habitat.*—As given for *P. (A.) stanfordi*.
- Depth.*—3-55 fms.

*Remarks.*—While *P. (A.) angustus* was taken in a number of the same dredge hauls as *P. (A.) stanfordi* Rathbun (1898), none of the former were encountered at depths greater than 55 fms, while the latter was dredged six times at depths of over 55 fms to depths as great as 150 fms.

The reduction in size of the alternate anterolateral spines, suggestive of the genus *Cronius*, is diagnostic of the species, together with the smooth, flat carapace and the short lateral spine.

***Portunus (Achelous) tuberculatus* (Stimpson)**

Plate 71, Fig. 2

*Achelous tuberculatus* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 223 (95), 1860.

*Portunus (Achelous) tuberculatus* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 596, 1898; Bull. 152, U.S. Nat. Mus., p. 90, pl. 44, and synonymy, 1930. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 629, 1931. Crane, Zoologica, vol. 22, no. 3, p. 68, 1937.

*Type locality.*—Cape San Lucas, Lower California.

*Types.*—Cotypes in Brit. Mus., MCZ, and USNM, No. 19679.

*Range.*—From Cape San Lucas (*Xantus*) to Panama (*Albatross*); Gorgona Island, Colombia (*Crossland*); 3-29 fms (*Crane*).

*Diagnosis.*—Carapace with many tubercles, a spine at posterior angles. Lateral spine exceedingly long, not at all forward directed. No spine at posterodistal angle of merus of fourth leg.

*Material examined* (5 specimens from 4 stations).—

66a-33. Tagus Cove, Albemarle Island, "roach" trap, attached to fish trap, Feb. 9, 1933, 1 young.

87-33. South Seymour Island, 15 fms, Feb. 19, 1933, 1 ovig. female (photographed).

783-38. Darwin Bay, Tower Island, 40-70 fms, Jan. 16, 1938, 1 ovig. female.

785-38. Darwin Bay, Tower Island, 20-40 fms, Jan. 17, 1938, 1 male, 1 female.

*Measurements.*—Ovigerous female: length 7.9 mm, width including lateral spines 16.6 mm, cheliped 16.0 mm, chela 7.5 mm, dactyl 4.2 mm.

*Habitat.*—White sand, sand and rock, sand and coral.

*Depth.*—3-70 fms.

*Remarks.*—This rarest of swimming crabs in the Galapagos Islands may be distinguished from the two commoner species, *P. (A.) stanfordi* Rathbun and *P. (A.) angustus* Rathbun, by the paired spine on the posterior margin of the carapace, although it may be incipient in young specimens.

*P. (A.) tuberculatus* is now recorded from the Galapagos Islands. Its vertical range has been increased to 70 fms.

Genus **CRONIUS** Stimpson, 1860

**Cronius ruber** (Lamarck)

Plate 72, Figs. 3, 4

*Portunus ruber* Lamarck, Hist. Nat. Anim. sans Vert., vol. 5, p. 260, 1818.

*Cronius ruber* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 225 (97), 1860. Rathbun, Zoologica, vol. 5, no. 14, p. 159, 1924; Bull. 152, U.S. Nat. Mus., p. 139, pls. 62 and 63, and synonymy, 1930. Boone, Zoologica, vol. 8, no. 4, p. 182, fig. 62, 1927. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 630, 1931. Sivertsen, Med. fra det. Zool. Mus., Oslo, nr. 38, p. 13, 1933.

*Type locality.*—Brazil.

*Type.*—Not located.

*Range.*—From Port San Bartholomé, Lower California (*Albatross*), to Paita, Peru (Schmitt); Galapagos Islands (Williams Expedition); 4-10 fms; also occurs in the Atlantic.

*Diagnosis.*—All spines tipped with black; 4 spines on manus. Basal lobe of antenna prolonged into orbital hiatus.

*Material examined* (11 specimens from 10 stations).—

33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 2 males.

96a-33. Darwin Bay, Tower Island, fish trap, Feb. 24, 1933, 1 large male.

101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 1 male.

163-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 1 large ovig. female.

167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, chela.  
-34. Charles Island, fish trap, Jan. 19, 1934, 1 ovig. female.

177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 1 male.

313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 1 male (photographed).

339-35. Sullivan Bay, James Island, 10 fms, Dec. 12, 1934, 1 specimen.

359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 1 male.

*Measurements*.—Largest male: length 56 mm, width 84 mm, cheliped 115 mm, chela 60 mm, dactyl 31.5 mm.

*Habitat*.—Rocky shore and shoal water.

*Depth*.—4-20 fms.

*Remarks*.—This largest of swimming crabs in the Galapagos Islands was obtained once in a dredge haul, twice by shore parties, and three times in lobster traps. Four spines on the hand serve to distinguish the young of this species from *P. (A.) angustus* Rathbun.

Subfamily **PODOPHTHALMINAE**

Genus **EUPHYLAX** Stimpson, 1860

**Euphylax dovii** Stimpson

Plate 72, Figs. 1, 2

*Euphylax dovii* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 226 (98), pl. 3 (not 5), figs. 5 and 5a, 1860. Rathbun, Bull. 152, U.S. Nat. Mus., p. 147, pl. 65, 1930.

*Type locality*.—West coast of Central America.

*Type*.—Not extant.

*Range*.—West coast of Mexico? (A. Milne Edwards), Panama (Ward), Talcahuano, Chile (MCZ).

*Diagnosis*.—Orbits occupying whole of anterior border of carapace except for narrow front. Eyes borne on long stalks. Anterolateral margins 5-spined.

*Material examined*.—

9-32. Tagus Cove, Albemarle Island, surface at light, Jan. 6, 1932, 12 specimens (1 photographed).

*Measurements*.—Largest specimen, male: length 32 mm, width 52 mm, cheliped 83 mm, chela 42 mm, dactyl 23 mm.

*Habitat*.—Pelagic.

*Depth*.—Surface.

*Remarks*.—*E. dovii* undoubtedly occurs in great numbers in the Galapagos Islands during the seasonal invasion of the warmer waters of El Niño current from the Bay of Panama. Countless numbers of these periscopic-eyed swimmers were observed at Cocos Island in 1938. They were being gathered by fishermen into bait tanks to be released later as chum for tuna in lieu of sardines.

*E. dovii* is now recorded from the Galapagos Islands.

Family *ATELECYCLIDAE*Genus *KRAUSSIA* Dana, 1852*Kraussia* Dana, Amer. Journ. Sci. and Arts, vol. 13, no. 37, p. 120, 1852.*Kraussia* Alcock, Journ. Asiatic Soc. Bengal, vol. 68, pt. 2, no. 3, p. 97, 1899.

*Carapax paulo transversus, margine postero-laterali breve, fronte denticulato, medio emarginato. Antennae internae obliquae. Pedes 8 postici natatorii, tarso falciformi. Articulus maxillipedis externi 3tius vix oblongus.* (Dana).

Carapace not much broader than long, not concealing the first three abdominal terga even in the male, subcircular but with the antero-lateral borders much longer than the postero-lateral, and the latter rather strongly convergent and slightly concave: the regions not defined.

Front well separated from and prominent beyond the inner supra-orbital angles, almost horizontal, cut into two lobes which may, or may not, be again divided into two lobules.

The antennules fold alongside their basal joint, much nearer the longitudinal than the transverse.

The basal antenna-joint touches the front and occupies all the space between the antennular pits and the orbit: the flagellum, which is short and slender, stands in the orbital hiatus.

Buccal cavern squarish, a little elongate: the external maxillipeds—of which the merus is not elongate—slightly overlap the epistome, which though short and sunken is well enough defined. No ridges on the palate to define the efferent branchial channels.

Cheliped massive, short and stumpy with particularly stumpy fingers. Legs short and stout, ending in blade-like dactyli.

The abdomen of the male consists of 5 segments, the 3rd-5th terga being fused.

Sternum narrow. (Alcock)

The writer follows Rathbun (1911, p. 211) and Balss (Journ. Roy. Soc. Western Australia, vol. 21, 1934-35, p. 132) in assigning the genus *Kraussia* to the family Atelecyclidae.

*Kraussia americana* Garth

Plate 73, Figs. 1, 2

*Kraussia americana* Garth, Allan Hancock Pac. Exped., vol. 5, no. 2, p. 19, pl. 7, figs. 1-4, 1939.

*Type locality*.—Puerto Refugio, Angel de la Guardia Island, Gulf of California.



*Type*.—AHF no. 371.

*Range*.—From Angel de la Guardia Island, Gulf of California, to Secas Islands, Panama (*Velero III*); Galapagos Islands (*Velero III*).

*Diagnosis*.—Front bilobed, subtruncate; lobes arched. Carapace one and one-third times as broad as long. Anterolateral margin greatly exceeding posterolateral margin. Orbits reduced to slits dorsally; eyes small. Fingers of nearly equal length, gaping in a broad oval. First segment of palpus of third maxilliped inflated and horizontally compressed. Margins of carapace and legs fringed with long, cylindrical, golden hairs.

*Material examined* (10 specimens from 8 stations).—

46-33. Barrington Island, 4-10 fms, Feb. 2, 1933, 1 young.

66-33. Tagus Cove, Albemarle Island, 10-20 fms, Feb. 9, 1933, 1 male.

149-34. Tagus Cove, Albemarle Island, 20 fms, Jan. 13, 1934, 1 young.

177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 1 female.

187-34. Cartago Bay, Albemarle Island, 8-10 fms, Jan. 25, 1934, 1 young.

193-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 27, 1934, 1 young.

204-34. Gardner Bay, Hood Island, 30 fms, Jan. 31, 1934, 2 males.

795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 1 male, 1 female.

*Measurements*.—Male holotype: length of carapace 10.9 mm, width 14.7 mm, of front 6.3 mm, chela 8.3 mm, manus 5.0 mm, movable finger 6.3 mm, immovable finger 3.7 mm, height of gape 2.3 mm.

*Color in life*.—From Gulf of California specimen: carapace pale apricot orange, a triangular red space on branchial region. Chelae pale cream color with a few touches of red. Fingers light bone brown, fading on tips. Ambulatory legs light cream buff, semitransparent, and with a few touches of bright red. Ventral side clear white. (Petersen)

*Habitat*.—On clean white sand.

*Depth*.—4-40 fms.

*Remarks*.—Because both are white and hairy, *Kraussia americana* may be confused with *Acidops fimbriatus* Stimpson, of the family Xanthidae. The minute orbits of the former, contrasted with the long eye stalks of the latter, and the peculiar, curved fingers of *Kraussia* with their imbedded brushes of hair serve readily to distinguish one from the other.

The existence of *Kraussia*, an Old World genus, in the Galapagos Islands, along with *Maldivia*, *Daldorfia*, and others, indicates a trans-pacific origin of a proportion of the Galapagos crustacean fauna which will undoubtedly increase as exploration continues.

Family *XANTHIDAE*Genus *CARPILODES* Dana, 1851*Carpilodes cinctimanus* (White)

Plate 74, Figs. 1-4

*Carpilius cinctimanus* White, in Jukes, Narrative Voy. H.M.S. Fly, vol. 2, append. no. 8, p. 336, pl. 2, fig. 3, 1847.

*Carpilodes cinctimanus* Miers, Ann. Mag. Nat. Hist., ser. 5, vol. 5, p. 234, 1880. Rathbun, Bull. 152, U.S. Nat. Mus., p. 242, pl. 100, and synonymy, 1930. Crane, Zoologica, vol. 12, no. 3, p. 69, 1937.

*Liomera cocosana* Boone, Zoologica, vol. 8, no. 4, p. 184, fig. 63, 1927.

*Type locality*.—Indian Ocean and Eastern Seas.

*Type*.—Not in Brit. Mus.

*Range*.—From Arena Bank, Gulf of California (*Zaca*), to Maria Madre Island, Mexico (Contreras); Galapagos Islands (*Arcturus*); occurs also in Australia, Japan, and islands of the Pacific.

*Diagnosis*.—Carapace twice as broad as long, cut into 3 large lobes. Wrists banded with black in adult male.

*Material examined* (190 specimens from 24 stations).—

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 5 males, 7 females (2 ovig.), 24 young.

38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 1 female.

47-33. Barrington Island, 2 fms, Feb. 2, 1933, 1 male.

48-33. Barrington Island, shore, Feb. 2, 1933, 9 young.

69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 4 males, 25 young.

73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 1 male, 1 female, 3 young.

76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 6 males, 1 female, fragment.

80-33. Duncan Island, coral, Feb. 15, 1933, 1 male, 1 young.

82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 1 young.

94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 3 males, 4 females (1 ovig.), 10 young.

96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 2 males.

97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 6 males, 7 females (1 ovig.), 11 young.

98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 1 male, 1 female, 1 young.

- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 3 males, 2 females.
- 101a-33. Darwin Bay, Tower Island, coral, Feb. 26, 1933, 1 male, 2 females (1 ovig.).
- 166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 1 male.
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 2 females.
- 194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 1 male, 2 females, 1 young.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 1 male.
- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 2 young.
- 343-35. Sullivan Bay, James Island, coral, Dec. 12, 1934, 1 male.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 4 males, 7 females (including the photographed pair), 2 fragments.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 2 males.
- 811-38. Barrington Island, coral, Jan. 26, 1938, 10 males, 6 females, 3 young.

*Measurements.*—Largest male: length 23.0 mm, width 42.5 mm, cheliped 36.0 mm, chela 20.0 mm, dactyl 11.9 mm; largest female: length 20.7 mm, width 38.3.

*Color in life.*—Carapace claret brown shading into dragon's blood red on marginal lobes. Appendages dragon's blood red with a band of claret brown on each segment. Chelae black. Dactyls of walking legs white, nail yellow.

*Habitat.*—*Pocillopora* coral clumps.

*Depth.*—Shoal water.

*Remarks.*—*C. cinctimanus* belongs to the *Pocillopora* coral fauna, and, when occasional specimens are encountered under rocks at low tide level, a diligent search seldom fails to reveal coral nearby.

*Growth.*—An interesting growth series has been arranged, showing complete intergradation between pure white young and pure red adult with black banded wrists. The color appears at first as a delicate pink which gradually deepens, rather than as a series of widening bands, as in *Actaea dovi* Stimpson (pl. 79, fig. 2). The 2.7 mm specimen described by Crane (1937) was thought to be of the latter species until a single banded *Carpilodes* was noted among *Velero III* collections also.

Genus **PLATYPODIA** Bell, 1835KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Platypodia*

- A<sup>1</sup> Mesogastric region linear, protogastric lobule bifid . . . . . *P. rotundata*  
 . . . . .  
 A<sup>2</sup> Mesogastric region broadened anteriorly, protogastric lobule  
 entire . . . . . *P. gemmata*

**Platypodia gemmata** Rathbun

Plate 79, Fig. 1

*Platypodia gemmata* Rathbun, Proc. Washington Acad. Sci., vol. 4, p. 279, pl. 12, figs. 5 and 6, 1902; Bull. 152, U.S. Nat. Mus., p. 249, text fig. 40, 1930. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 633, 1931. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 15, 1933. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Type locality*.—Albemarle Island, Galapagos Islands.

*Type*.—USNM No. 24850.

*Range*.—Galapagos Islands, Albemarle (Hopkins-Stanford Expedition); Bay of Panama, Taboga Island (Crossland).

*Diagnosis*.—Carapace rotund, areolate, margin cristate. Mesogastric region broadened anteriorly. Palm with transverse ridges; superior crest high.

*Material examined* (82 specimens from 26 stations).—

- 24-33. Gardner Bay, Hood Island, shore, Jan. 24, 1933, 1 male, 1 ovig. female.  
 30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 1 young.  
 38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 1 young.  
 59-33. Off Cormorant Bay, Charles Island, 13 fms, Feb. 6, 1933, 1 female.  
 65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 1 male, 1 large female.  
 71-33. James Bay, James Island, shore, Feb. 12, 1933, 2 males, 1 female.  
 76-33. Cartago Bay, Albemarle Island, coral, Feb. 14, 1933, 10 males, 9 females.  
 82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 2 females.  
 85-33. North Seymour Island, shore, Feb. 18, 1933, 3 young.  
 93-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 2 males, 2 females.

- 96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 1 ovig. female.
- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 2 ovig. females.
- 152-34. Tagus Cove, Albemarle Island, coral, Jan. 14, 1934, 3 males, 1 female, 1 young.
- 154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 3 males, 1 female, 1 young.
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 1 male, 1 female.
- 174-34. South Seymour Island, shore, Jan. 22, 1934, 1 male, 1 young.
- 175-34. North Seymour Island, shore, Jan. 22, 1934, 1 male, 1 female.
- 306-35. Marchena Island, shore, Dec. 2, 1934, 1 specimen.
- 316-35. Opposite Gordon Rocks, Indefatigable Island, 20 fms, Dec. 8, 1934, 1 ovig. female.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 2 specimens.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 7 males, 3 females.
- 361-35. Gardner Bay, Hood Island, 12 fms, Dec. 19, 1934, 1 specimen.
- 782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 1 male, 4 females.
- 784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 1 male, 1 young female.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 2 young males.
- 804-38. Onslow Island, off Charles Island, coral, Jan. 23, 1938, 2 males.

*Measurements.*—Largest male: length 13.0 mm, width 18.2 mm, cheliped 17.4 mm, chela 9.2 mm, dactyl 5.2 mm.

*Color in life.*—Ground color of carapace reddish naphthalene violet. Tubercles and margin dark dull purple. Outer side of cheliped light brilliant neutral red extending slightly on movable finger. Fingers dull dark yellow, lighter toward tip. Ambulatory legs Brazil red. Color extends half way on dactyl, which is dull yellow. Nail banded with brown at root, bright yellow at tip. Ventral side jasper red; abdomen brick red; legs scarlet beneath. (Petersen)

*Habitat.*—In circular depressions, particularly in sponges.

*Depth.*—An intertidal species; occasionally to 15 or 20 fms.

*Remarks.*—These *Platypodias* fit so snugly into the circular depressions which they have hollowed out for themselves that they are likely to be overlooked. They were most abundant in rocks near a sandy shore where a clump of dead trees forms a conspicuous landmark a few miles north of the anchorage at Cartago Bay, where 19 were found.

From the fact that Finnegan (1931) records the mainland species, *P. rotundata* (Stimpson) (1860) from the Galapagos Islands, it might be expected that some of the Hancock series would prove to be of that species also. However, comparison of selected pairs with the type of *P. gemmata* (USNM No. 24830) and with the Rathbun photographed specimen of *rotundata* (No. 4079) collected by Capt. Dow at Panama conclusively shows all Hancock Galapagos *Platypodias* to be *gemma*, none having the linear mesogastric or bifid protogastric region of *rotundata*.

### *Platypodia rotundata* (Stimpson)

*Atergatis rotundatus* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 202 (74), 1860.

*Platypodia rotundata* Rathbun, Proc. U.S. Nat. Mus., vol. 38, p. 584, 1910; Bull. 152, U.S. Nat. Mus., p. 248, pl. 102, figs. 1-3, and synonymy, 1930. Finnegan, Journ. Linn. Soc. London, Zool., vol. 37, no. 255, p. 633, 1931.

*Type locality*.—Cape San Lucas, Lower California.

*Types*.—Cotypes in MCZ.

*Range*.—From La Paz, Gulf of California (Lockington), to Pta. Santa Elena, Ecuador (Schmitt); Galapagos Islands (Crossland).

*Atlantic analogue*.—*P. spectabilis* (Herbst).

*Diagnosis*.—Carapace rotund, areolate, margin cristate. Mesogastric region narrowed anteriorly, protogastric region divided into two distinct lobules.

*Material examined*.—None from the Galapagos Islands. The Hancock collections contain a long series of this species from Escondido Bay, Gulf of California, to Santa Elena Bay, Ecuador.

*Remarks*.—Since Finnegan (1931) recorded both *P. gemmata* and *P. rotundata* from among Galapagos material collected by Crossland on the *St. George* Expedition, it is presumed that she was familiar with the distinguishing features of both species. However, her inclusion of *P. gemmata*, regarded heretofore as a Galapagos endemic species, in the Taboga Island, Bay of Panama, fauna, where *rotundata* would be expected, suggests that she may have placed too much emphasis upon the presence or absence of hair in the depressions of the carapace, a feature given as diagnostic by Rathbun (1930), and not enough upon the shape of the proto- and mesogastric regions, which is the structural basis for separation of the two species.

Genus **ACTAEA** de Haan, 1833KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Actaea*

- A<sup>1</sup> Carapace covered with raised smooth nodules, deeply separated  
 . . . . . *A. sulcata*
- A<sup>2</sup> Carapace areolate, areoles granulate and not deeply separated  
 B<sup>1</sup> Carapace narrow, areoles covered with bead granules . . .  
 . . . . . *A. angusta*
- B<sup>2</sup> Carapace wider, areoles sharp granulate  
 C<sup>1</sup> Areoles inconspicuous, scarcely elevated above general  
 carapace level; granules minute; leg joints granulous  
 . . . . . *A. dovii*
- C<sup>2</sup> Areoles conspicuous on anterior two-thirds of carapace;  
 granules increasing in size toward anterolateral mar-  
 gins; leg joints spinulous . . . . . *A. crosslandi*

**Actaea dovii** Stimpson

Plate 79, Figs. 2, 6

*Actaea dovii* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 10, p. 104, 1871. Rathbun, Proc. Washington Acad. Sci., vol. 4, no. 8, p. 281, 1902; Bull. 152, U.S. Nat. Mus., p. 254, pl. 104, figs. 1-2, 1930. Boone, Zoologica, vol. 8, no. 4, p. 203, fig. 71, 1927. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 632, 1931. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 15, 1933. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Type localities*.—San Salvador and Panama.

*Type*.—MCZ No. 1021.

*Range*.—From Arena Bank, Lower California (*Zaca*), to Ecuador (Nobili); Galapagos Islands (Hopkins-Stanford Expedition).

*Atlantic analogue*.—*A. setigera* (Milne Edwards).

*Diagnosis*.—Areoles inconspicuous, granulate. Carapace covered with fine hairs.

*Material examined* (250 specimens from 41 stations).—

28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 1 male, 1 female, 1 young.

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 16 males, 2 females, 9 young, 1 fragment.

33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 6 males, 3 females (1 ovig.).

47-33. Barrington Island, 2 fms, Feb. 2, 1933, 1 male, 1 female, 1 young.

- 48-33. Barrington Island, shore, Feb. 2, 1933, 13 males, 1 ovig. female.
- 59-33. Off Cormorant Bay, Charles Island, 13 fms, Feb. 6, 1933, 6 young.
- 69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 17 males, 4 females, 5 young.
- 71-33. James Bay, James Island, shore, Feb. 12, 1933, 1 male, 1 female.
- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 4 males, 2 females, 3 young.
- 76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 3 males.
- 80-33. Duncan Island, coral, Feb. 15, 1933, 7 males, 5 females, 3 young.
- 94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 4 males, 1 young.
- 96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 2 females.
- 97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 2 males, 1 female, 1 young.
- 98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 1 female.
- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 4 males, 1 female.
- 148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 1 female.
- 152-34. Tagus Cove, Albemarle Island, coral, Jan. 14, 1934, 1 male, 1 young.
- 154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 1 young.
- 166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 1 young.
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 3 males, 2 females.
- 194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 8 males, 4 females.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 2 males.
- 310-35. Marchena Island, 15 fms, Dec. 3, 1934, 1 male, 1 female.
- 313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 1 young.
- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 1 male, 1 female, 3 young.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, fragments.
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 10 males, 4 females, 2 young.



- 344-35. Bartholomew Island near James Island, coral, Dec. 12, 1934, 5 males, 2 females, 6 young.
- 350-35. South Seymour Island, shore, Dec. 13, 1934, 1 male, 1 female, 2 young.
- 357-35. Gardner Bay, Hood Island, coral, Dec. 17, 1934, 2 young.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 11 males, 5 females, 1 young, fragment.
- 782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 1 male.
- 784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 1 male, 1 female, 1 young.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 5 males, 1 female.
- 792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 1 young.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 13 males.
- 800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 1 male, 1 female.
- 803-38. Black Beach, Charles Island, shore, Jan. 23, 1938, 1 female.
- 804-38. Onslow Island, near Charles Island, coral, Jan. 23, 1938, 1 female, 2 young.
- 811-38. Barrington Island, coral, Jan. 26, 1938, 2 males.

*Measurements.*—Large male: length 15.6 mm, width 21.4 mm, cheliped, coxa to elbow 10.7 mm, elbow to tip of dactyl 14.0 mm, chela 12.2 mm, dactyl 7.0 mm.

*Color in life.*—Carapace and cheliped light neutral red, fingers dark dusky brown fading toward tip. Tubercles on carapace and cheliped cameo brown. Ambulatory legs vinaceous buff with reddish tint, netted with neutral red. Dactyls with blotches of neutral red at base, nail yellow. (Petersen)

*Habitat.*—*Pocillopora* coral and free living, under rocks.

*Depth.*—Shore and shoal water; occasionally to 12 or 15 fms; 1 record to 80 fms.

*Remarks.*—While *A. dovii* is found in the *Pocillopora* colony, it is by no means restricted to living coral but may be found on rocky shore or while diving at moderate depths. The posteriorly converging, reddish-brown bands of the carapace of the young (pl. 79, fig. 2) serve to separate them from immature *Carpilodes cinctimanus* (White), which occurs with them in the coral. In life the eye is bright begonia rose.

### ***Actaea angusta* Rathbun**

Plate 75, Figs. 1, 2

*Actaea angusta* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 582, pl. 42, fig. 2, 1898; Bull. 152, U.S. Nat. Mus., p. 256, pl. 104, figs. 7 and 8, text fig. 42, 1930.

*Type locality*.—Off Hood Island, Galapagos Islands.

*Type*.—USNM No. 21578.

*Range*.—Known only from the type locality.

*Atlantic analogue*.—*A. bifrons* Rathbun.

*Diagnosis*.—Carapace narrow, covered with bead granules; margin cut into 4 well-defined teeth. A small species.

*Material examined*.—

201-34. Off Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 1 young (photographed).

*Measurements*.—Length 4.3 mm, width 5.8 mm.

*Habitat*.—"Mostly rock." (Probably with sand patches.)

*Depth*.—20-35 fms.

*Remarks*.—Apparently this distinctive species is destined to remain a great rarity in collections, as repeated dredging over the type locality has yielded but one specimen in five expeditions, the first since the type. This specimen has been compared with the holotype (USNM No. 21578) and is identical in size and appearance. The pearly granules of the carapace and cheliped distinguish it from the remaining Galapagos members of the genus.

### ***Actaea sulcata* Stimpson**

Plate 77, Fig. 1

*Actaea sulcata* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 203 (75), 1860. Rathbun, Bull. 152, U.S. Nat. Mus., p. 259, pl. 105, figs. 3 and 4, 1930. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 632, 1931. Crane, Zoologica, vol. 22, no. 3, p. 69, 1937.

*Type locality*.—Cape San Lucas, Lower California.

*Type*.—Not extant.

*Range*.—From Arena Bank, Gulf of California (Crane), to Gorgona Island, Colombia (Crossland); 2½-15 fms.

*Atlantic analogue*.—*A. rufopunctata nodosa* Stimpson.

*Diagnosis*.—Carapace covered with raised nodules, deeply separated.

*Material examined* (44 specimens from 22 stations).—

28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 1 young.

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 1 male, 1 female, 2 young.

48-33. Barrington Island, shore, Feb. 2, 1933, 1 female, 1 young.

56-33. Flamingo Bay, Charles Island, shore, Feb. 5, 1933, 5 specimens.

59-33. Off Cormorant Bay, Charles Island, 13 fms, Feb. 6, 1933, 1 male, 2 young.

- 65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 1 male.
- 69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 2 young males.
- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 3 males.
- 76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 2 males, 1 fragment.
- 94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 1 male, 2 females (1 ovig.).
- 96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 1 male.
- 154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 1 female.
- 167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 1 female.
- 194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 1 female.
- 199-34. Black Beach, Charles Island, shore, Jan. 30, 1934, 1 female.
- 344-35. Bartholomew Island near James Island, coral, Dec. 12, 1934, 2 males.
- 356-35. Gardner Bay, Hood Island, 12-15 fms, Dec. 17, 1934, 1 young.
- 357-35. Gardner Bay, Hood Island, coral, Dec. 17, 1934, 2 females.
- 784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 1 female.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 1 male (photographed).
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 1 male, 2 females.
- 800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 1 male, 2 females.

*Measurements*.—Largest specimen, female: length 11.0 mm, width 17.0 mm, cheliped 14.0 mm, chela 7.5 mm, dactyl 4.3 mm.

*Color in life*.—General appearance neutral red with bluish tinge. Raised nodules on gastric, cardiac, and intestinal regions pale yellowish white. Cheliped and legs neutral red. Fingers warm Van Dyke brown, a touch of bright lavender at base of movable fingers, tips almost white. Dactyls of ambulatory legs orange yellow at base fading to near white. Nail pale yellow. (Petersen)

*Habitat*.—*Pocillopora*, or free living under rocks.

*Depth*.—Shore to 15 fms.

*Remarks*.—Like *A. dovii*, this species is found most frequently in living coral, but may be picked up from under rocks or dredged in 12-15 fms. It is less abundant than *A. dovii* in the proportion of about 1:5.

*A. sulcata* is now recorded from the Galapagos Islands.

***Actaea crosslandi* (Finnegan), new comb.**

Plate 56, Figs. 1-4

*Xanthias crosslandi* Finnegan, Journ. Linn. Soc. London, vol. 37, p. 638, 1931.

*Type locality*.—Tagus Cove, Galapagos Islands.

*Type*.—In Brit. Mus.

*Range*.—Known only from the type locality.

*Diagnosis*.—Carapace areolate on anterior two-thirds only. Hepatic region coarsely granulate. Anterolateral margin with 4 tuberculated teeth, excluding exorbital cluster; first depressed, second largest. Last three ambulatory segments spinulous.

*Material examined* (100 specimens from 21 stations).—

- 143-34. Wenman Island, 100-150 fms, Jan. 11, 1934, 1 young, fragment.
- 147-34. Tagus Cove, Albemarle Island, 30 fms, Jan. 13, 1934, 3 young.
- 148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 4 males, 3 females.
- 149-34. Tagus Cove, Albemarle Island, 20 fms, Jan. 13, 1934, 5 males, 8 females (4 ovig.).
- 166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 1 male.
- 167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 6 males, 2 females.
- 168a-34. Academy Bay, Indefatigable Island, coral, Jan. 20, 1934, 2 males.
- 169-34. Academy Bay, Indefatigable Island, 15-25 fms, Jan. 20, 1934, 9 males, 5 females.
- 170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 4 young.
- 182-34. James Bay, James Island, 30 fms, Jan. 24, 1934, 2 males, 3 females.
- 190-34. Lat. 0° 55' S, Long. 90° 30' W, 58-60 fms, Jan. 26, 1934, 2 young.
- 193-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 27, 1934, 3 males, 1 ovig. female.
- 196-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 29, 1934, 1 female, 1 young.
- 197-34. Off Post Office Bay, Charles Island, 35-40 fms, Jan. 29, 1934, 8 males, 10 females.
- 198-34. NW of Post Office Bay, Charles Island, 55-65 fms, Jan. 29, 1934, 1 male.

199-34. Black Beach, Charles Island, shore, Jan. 30, 1934, 1 male.

316-35. Gordon Rocks, Indefatigable Island, 20 fms, Feb. 8, 1934, 1 male.

317-35. Gordon Rocks, Indefatigable Island, 25-30 fms, Feb. 8, 1934, 2 females (1 ovig.).

792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 1 male.

795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 5 males, 4 females (2 ovig.).

810-38. (D-1) Barrington Island, 48 fms, Jan. 26, 1938, 1 young.

*Measurements*.—Male: length 10.3 mm, width 15.1 mm; female: length 10.1 mm, width 15.0 mm.

*Color in life*.—Carapace reddish salmon orange, slightly darker on frontal region and entirely covered with red spots, which become lighter toward the frontal and hepatic regions, where they almost disappear. Chela lighter than carapace, with spots much in evidence on carpus and propodus. Dactyl yellow to white tip. Legs as chelae with pale yellow hairs. (Petersen)

*Habitat*.—Rock, rock and sand, rock and algae; sand, sand and coral, sand and nullipore; coral, nullipore and worm tubes.

*Depth*.—From shore to 150 fms.

*Remarks*.—A pair of specimens from the type locality were sent to the British Museum for comparison with the type and were returned labeled "*Xanthias crosslandi* Finnegan" by Dr. Isabella Gordon. As restricted by Odhner (1925), only one American species, *X. inornatus* (Rathbun) (1898), belongs in this genus, and the writer proposes its transfer to the genus *Actaea* de Haan.

Genus **GLYPTOXANTHUS** A. Milne Edwards, 1879

**Glyptoxanthus hancocki** Garth

Plate 76, Figs. 1, 2

*Glyptoxanthus labyrinthicus* Rathbun, Bull. 152, U.S. Nat. Mus., p. 266, part (the Galapagos specimen), 1930.

*Glyptoxanthus hancocki* Garth, Allan Hancock Pac. Exped., vol. 5, no. 2, p. 15, pl. 4, fig. 1; pl. 5, figs. 1a, 2a, 3a, 1939.

*Type locality*.—Sullivan Bay, James Island.

*Type*. AHF no. 383.

*Range*.—Known only from the Galapagos Islands.

*Diagnosis*.—Elevations of carapace sparsely pitted. Gastric areole independent of inner protogastric. Front separated from rest of carapace by a transverse furrow joining orbits.

*Material examined* (22 specimens from 10 stations).—

- 33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 1 male.  
101-33. Darwin Bay, Tower Island, shore, Jan. 26, 1933, 2 males.  
313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 1 male.  
333-35. James Bay, James Island, shore, Dec. 11, 1934, 1 male, carapace.  
343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 1 male, chela.  
350-35. South Seymour Island, shore, Dec. 13, 1934, 1 specimen.  
782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 1 male.  
796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 2 males, 8 females (the type series, including the female holotype, AHF no. 383).  
800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 1 female.  
803-38. Black Beach, Charles Island, shore, Jan. 23, 1938, 1 male, 2 females.

*Measurements*.—Largest specimen, female, not holotype: length 25.8 mm, width 38.0 mm; male allotype: length 18.6 mm, width 26.9 mm.

*Color in life*.—Dark areas on carapace a rich violet carmine, a little more reddish on branchial and posterior areas. Light areas cadmium orange on frontal, gastric, and cardiac regions; branchial and intestinal regions same color but lighter hue. Chela violet carmine on dark areas; fingers very dark seal brown, fading toward tips, which are almost white. Ambulatory legs burnt lake on dark areas and light cadmium orange on light areas. Nail of dactyl amber. Eystalk pale orange-yellow; eye blackish brown. (Petersen)

*Habitat*.—Under rocks at low tide.

*Depth*.—Shore.

*Remarks*.—As set forth in the diagnosis of the species, *G. hancocki* differs from *G. labyrinthicus* (Stimpson) (1860) of the Bay of Panama in having the gastric areole independent of the inner protogastric, the orbits joined by an open, transverse furrow, and the vermiculation's sparsely pitted. Exceptionally low tides are necessary to uncover this brilliant red and orange xanthid crab, which is found in company with *Aethra scruposa scutata* Smith and *Daldorfa garthi* Glassell.

### Genus DAIRA de Haan, 1833

#### *Daira americana* Stimpson

Plate 82, Figs. 1, 2

- Daira americana* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 212 (84), 1860. Rathbun, Bull. U.S. Nat. Mus., p. 268, pl. 110, figs. 1 and 2, 1930. Hult, Arkiv. för Zoologi, Band 30A, no. 5, p. 12, 1938. Crane, Zoologica, vol. 22, no. 3, p. 70, 1937.

*Type locality*.—Cape San Lucas, Lower California.

*Type*.—MCZ No. 1275.

*Range*.—From Arena Bank, Gulf of California (*Zaca*), to Ecuador (Nobili); Galapagos Islands (Hult).

*Diagnosis*.—Regions subdivided into numerous rounded lobules, interspersed with tufts of hair. Fingers pointed at tips, not spoon shaped.

*Material examined* (431 specimens from 35 stations).—

- 27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 16 males, 6 females (3 ovig.), 30 young.
- 28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 8 males, 10 females (7 ovig.), 22 young.
- 30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 3 males, 13 females (8 ovig.), 14 young.
- 33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 5 males, 10 females (7 ovig.), 5 young.
- 38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 1 young.
- 47-33. Barrington Island, 2 fms, Feb. 2, 1933, 1 young.
- 69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 6 males, 4 females, 4 young.
- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 4 males, 8 females (1 ovig.).
- 76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 1 female.
- 94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 2 males, 4 young.
- 96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 1 male, 1 female, 3 young.
- 97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 1 male, 2 young.
- 98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 7 males, 5 females (4 ovig.), 4 young.
- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 2 males, 3 females (2 ovig.), 4 young.
- 101a-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 5 males, 1 ovig. female, 2 young.
- 154-34. Reef north of Tagus Hill, Albemarle Island, shore, Jan. 15, 1934, 1 male.
- 161-34. Black Beach, Charles Island, 3 fms, Jan. 17, 1934, 1 male.
- 163-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 3 females.
- 166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 19 males, 33 females (13 ovig.) (1 photographed).

- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 2 males.
- 194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 6 males, 3 females.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 6 males, 3 females.
- 313-35. Black Beach, Charles Island, shore, Dec. 6, 1935, 8 females, 2 young.
- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 6 males, 2 females, 12 young.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 1 male, 7 females.
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 1 male, 2 young.
- 350-35. South Seymour Island, shore, Dec. 13, 1934, 1 male, 1 female.
- 357-35. Gardner Bay, Hood Island, coral, Dec. 17, 1934, 3 males, 4 females, 8 young.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 9 males, 19 females.
- 784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 10 males, 10 females, 6 young.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 8 males, 6 females.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 2 males, 4 females (1 ovig.).
- 800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 1 female.
- 804-38. Onslow Island, near Charles Island, coral, Jan. 23, 1938, 2 young.
- 38. Academy Bay, Indefatigable Island, no date, 1938, Karl Kübler, collector, 1 young.

*Measurements*.—A large female: length 31.0 mm, width 44.0 mm, cheliped 38.0 mm, chela 23.7 mm, dactyl 12.0 mm.

*Color in life*.—Uniform rich chocolate brown. Eyes and under side prune purple. (Garth)

*Habitat*.—Under rocks and in *Pocillopora* coral.

*Depth*.—Shore to 3 fms.

*Remarks*.—In view of the fact that *D. americana* was the first brachyuran encountered by the Hancock Expedition of 1933 and one of the most abundant thereafter, it seemed incredible that it had not previously been taken in the Galapagos Islands. The ship's crew, with a little instruction, could be relied upon to bring back this species among the half dozen which they learned to recognize by sight, aided no doubt by its chocolate-brown color and the distinctive rounded nodules of the carapace.



Genus **LIPAESTHESIUS** Rathbun, 1898**Lipaesthesius leeanus** Rathbun

Plate 75, Figs. 3, 4

*Lipaesthesius leeanus* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 585, pl. 42, figs. 4 and 5, 1898; Bull. 152, U.S. Nat. Mus., p. 272, pl. 112, text fig. 43, 1930.

*Medaeus rugosus* Boone, Zoologica, vol. 8, p. 201, fig. 70, 1927.

*Type locality*.—Southern part of the Gulf of California, 10 fms.

*Type*.—USNM No. 21581.

*Range*.—East of La Paz, Gulf of California (*Albatross*); Galapagos (*Arcturus*) (as *Medaeus rugosus*); 4-10 fms.

*Diagnosis*.—Anterolateral margins running obliquely downward and forward to the buccal cavity, instead of to the orbits. Antennal flagellum completely concealed by large basal article bordering the orbit.

*Material examined* (13 specimens from 5 stations).—

69a-33. Albemarle Point, Albemarle Island, 12 fms, bottom sample, Feb. 11, 1933, 2 specimens.

167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 4 males.

177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 2 males, 1 female.

196-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 29, 1934, 1 male, 1 female.

795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 2 females (1 photographed).

*Measurements*.—Largest female: length 5.6 mm, width 8.0 mm.

*Habitat*.—The character of the bottom, where noted, was "very rocky" or "rock with sand patches." In two instances the dredge brought up a pair.

*Depth*.—4-40 fms.

*Remarks*.—The writer has examined the type of *Medaeus rugosus* Boone in the collection of the New York Zoological Society and agrees with Rathbun (1930) that it is identical with *L. leeanus*.

The aptness of the name *Lipaesthesius*, which means "to lack perception by feeling," vanishes with the discovery that a small but complete antennal flagellum exists, although hidden from view by the basal antennal article.

The vertical range of the species has been extended to 40 fms.

Genus **MEDAEUS** Dana, 1851KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Medaeus*

- A<sup>1</sup> Carapace and chelipeds areolate; legs with lobate crests . . . . . *M. lobipes*  
 . . . . .  
 A<sup>2</sup> Carapace and chelipeds spinulose; legs spinulose also . . . . . *M. spinulifer*  
 . . . . .

**Medaeus lobipes** Rathbun

Plate 77, Fig. 2

*Medaeus lobipes* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 583, pl. 44, fig. 1, 1898; Bull. 152, U.S. Nat. Mus., p. 275, pl. 114, text fig. 44, 1930. Crane, Zoologica, vol. 22, no. 3, p. 70, 1937.

*Type locality*.—Panama Bay, 33 fms.

*Type*.—USNM No. 21580.

*Range*.—From Santa Inez Bay, Gulf of California (*Zaca*), to Panama (*Albatross*); Galapagos Islands (*Albatross*); 5½-33 fms (Crane).

*Atlantic analogue*.—*M. spinimanus* (Milne Edwards).

*Diagnosis*.—Carapace coarsely areolate. Anterolateral margin cut into 4 prominent teeth. Carpus and propodus of walking legs cristate. Manus with a superior crest of lobules.

*Material examined* (55 specimens from 18 stations).—

55-33. Lat. 1° 03' 30" S, Long. 90° 17' 30" W, 60 fms, Feb. 5, 1933, 1 carapace.

143-34. Wenman Island, 100-150 fms, Jan. 11, 1934, 7 males, 5 females (1 ovig.).

147-34. Tagus Cove, Albemarle Island, 30 fms, Jan. 13, 1934, 2 males.

155-34. Tagus Cove, Albemarle Island, 50-60 fms, Jan. 15, 1934, 1 male, 1 female.

156-34. Tagus Cove, Albemarle Island, 80-100 fms, Jan. 15, 1934, fragments.

170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 1 male.

171-34. East of Wreck Bay, Chatham Island, 35-40 fms, Jan. 21, 1934, 1 ovig. female.

182-34. James Bay, James Island, 30 fms, Jan. 24, 1934, 1 young male.

183-34. James Bay, James Island, 50-70 fms, Jan. 24, 1934, 3 males, 1 ovig. female.

201-34. Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 7 males.

324-35. Tagus Cove, Albemarle Island, 45 fms, Dec. 10, 1934, 5 males (1 photographed), 5 ovig. females.

- 345-35. South Seymour Island, 30 fms, Dec. 13, 1934, 1 female.  
346-35. Between South Seymour and Daphne Islands, 55 fms, Dec. 13, 1934, 1 female.  
788-38. SE of Daphne Major Island, 55 fms, Jan. 19, 1938, 1 female.  
795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 3 females (1 ovig.).  
810-38. (D-1) Barrington Island, 48 fms, Jan. 26, 1938, 3 males, 1 female.  
810-38. (D-2) Barrington Island, 73 fms, Jan. 26, 1938, 1 male, 1 young.  
816-38. North of Hood Island, 50-100 fms, Jan. 29, 1938, 1 female.

*Measurements*.—Largest male: length 16.4 mm, width 22.7 mm, cheliped 27.0 mm, chela 15.7 mm, dactyl 8.7 mm; largest female: length 12.7 mm, width 18.4 mm.

*Color in life*.—Ground color of carapace orange chrome. Granules dark grenadine red, giving carapace a bright orange-red color. Frontal, intestinal, and anterolateral areas bright ox-blood red. Marginal teeth and hepatic region white with yellowish tint. Chela same color as carapace externally. Dactyls dark Indian red, tips almost white. Ambulatory legs like carapace but granules a shade darker, bands white. (Petersen)

*Habitat*.—Rock, rock and sand, rock and shell, rock and coral, rock and nullipore; sand, sand and coralline; mud and shell.

*Depth*.— $5\frac{1}{2}$ -150 fms.

*Remarks*.—*M. lobipes* was taken in many of the same dredge hauls as *Actaea crosslandi* (Finnegan). The two species have much in common but may always be distinguished by the cristate legs of *M. lobipes*, those of *A. crosslandi* being spiny granulate.

### **Medaeus spinulifer (Rathbun)**

Plate 75, Figs. 5, 6

*Pilumnus spinulifer* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 585, pl. 42, figs. 6-8, 1898; Proc. Washington Acad. Sci., vol. 4, p. 281, 1902. Boone, Zoologica, vol. 8, no. 4, p. 217, fig. 79, 1927. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 643, 1931.

*Medaeus spinulifer* Rathbun, Bull. 152, U.S. Nat. Mus., p. 276, text fig. 45, 1930.

*Type locality*.—Off Cape San Lucas, 31 fms.

*Type*.—USNM No. 21582.

*Range*.—Cape San Lucas, Lower California (*Albatross*); Galapagos Islands (Hopkins-Stanford Expedition);  $2\frac{1}{2}$ -31 fms.

*Diagnosis*.—Carapace and chelipeds rough and spinulose. Antero-lateral margins with 4 compound spines and a subhepatic cluster of spinules. Legs spinulose. Tip of male abdomen concave.

*Material examined* (39 specimens from 19 stations).—

- 47-33. Barrington Island, 2 fms, Feb. 2, 1933, 1 young male.  
59-33. Off Cormorant Bay, Charles Island, 13 fms, Feb. 6, 1933, 1 young.  
148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 1 male (photographed), 3 females, 1 young.  
149-34. Tagus Cove, Albemarle Island, 20 fms, Jan. 13, 1934, 1 male.  
155-34. Tagus Cove, Albemarle Island, 50-60 fms, Jan. 15, 1934, 1 female.  
157-34. Tagus Cove, Albemarle Island, 10-18 fms, Jan. 15, 1934, 1 male, 1 female.  
162-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 1 female.  
167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 1 female.  
177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 1 young male.  
187-34. Cartago Bay, Albemarle Island, 8-10 fms, Jan. 25, 1934, 1 young.  
197-34. Off Post Office Bay, Charles Island, 35-40 fms, Jan. 29, 1934, 1 specimen.  
311-35. Marchena Island, 20 fms, Dec. 3, 1934, 1 large male, 3 young.  
322-35. Tagus Cove, Albemarle Island, 10 fms, Dec. 10, 1934, 1 male.  
330-35. Tagus Cove, Albemarle Island, 12 fms, Dec. 12, 1934, 1 male.  
346-35. Between South Seymour and Daphne Islands, 55 fms, Dec. 13, 1934, 1 male, 1 young.  
352-35. East of Wreck Bay, Chatham Island, 30 fms, Dec. 15, 1934, 1 specimen.  
795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 5 males, 4 females, 3 young.  
807-38. Academy Bay, Indefatigable Island, 10-25 fms, Jan. 24, 1938, 1 male.  
810-38. Barrington Island, 48-73 fms, Jan. 26, 1938, 1 male.

*Measurements*.—Largest male: length 9.0 mm, width 12.7 mm, cheliped (rigid) coxa to elbow 6.0 mm, elbow to tip of dactyl 10.0 mm, chela 9.3 mm, dactyl 5.8 mm; largest female: length 8.2 mm, width 11.5 mm.

*Habitat*.—Rock, rock with sand patches, rock with coral and nullipore; sand, sand and shell; mud and shell.

*Depth*.—Shore to 73 fms.

*Remarks*.—Although referred by Rathbun (1930) to the genus *Medaeus* because of certain structural peculiarities, the appearance of this crab is that of a *Pilumnus*.

Genus **CYCLOXANTHOPS** Rathbun, 1897

***Cycloxanthops vittatus*** (Stimpson)

Plate 79, Fig. 5

*Xantho vittata* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 206 (78), 1860.

*Cycloxanthops vittatus* Rathbun, Mem. Mus. Comp. Zool., vol. 35, p. 70, 1907; Bull. 152, U.S. Nat. Mus., p. 291, pl. 133, figs. 3 and 4; pl. 134, fig. 3, 1930. Boone, Zoologica, vol. 8, no. 4, p. 197, fig. 68, 1927. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 15, 1933.

*Type locality*.—Panama and Cape San Lucas.

*Types*.—Cotypes from Cape San Lucas in MCZ, No. 1260.

*Range*.—From Cape San Lucas (Xantus), to Panama (Dow); Galapagos Islands (*Arcturus*).

*Diagnosis*.—Front advanced, truncate, separated from orbit by a notch. Carapace narrow, anterolateral margins arcuate, broken into 9 sharp teeth. A denticle on inner slope of orbit.

*Material examined* (44 specimens from 21 stations).—

27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 2 males.

33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 1 large female.

73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 1 male, 1 female.

76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 1 male.

80-33. Duncan Island, coral, Feb. 15, 1933, 1 young.

98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 1 male, 1 ovig. female.

154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 1 female.

166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 1 female.

167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 1 male.

202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 2 males.

204-34. Gardner Bay, Hood Island, 30 fms, Jan. 31, 1934, 2 males, 2 females.

314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934; 2 specimens.

- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 1 female.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 7 specimens.
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 2 males, 2 ovig. females.
- 354-35. Wreck Bay, Chatham Island, shore, Dec. 15, 1934, fragment.
- 782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 1 male.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 3 males.
- 800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 1 male.
- 811-38. Barrington Island, coral, Jan. 26, 1938, 2 males, 1 female, 2 young.
- 811a-38. Barrington Island, *Pavona* coral, Jan. 26, 1938, 1 young male.
- Measurements*.—Largest specimen, male: length 16.3 mm, width 21.6 mm, cheliped 23.0 mm, chela 12.8 mm, dactyl 7.0 mm.
- Color in life*.—Carapace white overcast with tiny pale orange to red spots more intense in grooves separating areolations and more numerous on gastric and intestinal regions. Cheliped white, fingers dull clay color. Ambulatory legs white. Eystalks streaked with pale orange, eye very light. (Petersen) A young specimen: carapace grayish olive with lavender tint. Chelae show more lavender. Fingers yellowish dusky drab. (Garth)
- Habitat*.—In coarse gravel at high tide level; larger individuals under rocks at low tide level.
- Depth*.—Shore; occasionally to 30 fms.
- Remarks*.—Small specimens of the "Cameo Crab," as *C. vittatus* is called, were encountered in coarse gravel near the high tide line in company with *Leptodius cooksoni* Miers and *Lophoxanthus lamellipes* (Stimpson). Larger individuals were found among the bright coralline- and bryozoan-encrusted rocks of the low tide level. In each case the crab matched the coloration of its surroundings.

### Genus **LEPTODIUS** A. Milne Edwards, 1863

#### KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Leptodius*

- A<sup>1</sup> Anterolateral margins of carapace thick and lobed . . . *L. cooksoni*  
 A<sup>2</sup> Anterolateral margins of carapace thin and denticulate  
     B<sup>1</sup> Hand with external transverse ridges . . . *L. snodgrassi*  
     B<sup>2</sup> Hand without external transverse ridges . . . *L. occidentalis*

### **Leptodius occidentalis** (Stimpson)

*Chlorodius occidentalis* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 10, p. 108, 1871.

*Leptodius occidentalis* A. Milne Edwards, Crust. Reg. Mex., p. 269, 1880. Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 589, 1898; Bull. 152, U.S. Nat. Mus., p. 301, pl. 137, figs. 3-4; pl. 138, fig. 2 and synonymy, 1930.

*Xanthodius occidentalis* Boone, Zoologica, vol. 8, no. 4, p. 195, figs. 67A-B, 1927.

*Type locality*.—Panama and Manzanillo, Mexico.

*Type*.—Not extant.

*Range*.—From Magdalena Bay, Lower California (Orcutt), and Guaymas, Sonora, Mexico (*Albatross*), to Manzanillo, Mexico (Orcutt), Galapagos Islands (*Albatross*).

*Atlantic analogue*.—*L. floridanus* (Gibbes).

*Diagnosis*.—Anterolateral margin thin, 5-toothed, including orbital tooth. Carapace with transverse ridges. Outer surface of palm without longitudinal furrows.

*Material examined*.—None from the Galapagos taken by Hancock Expeditions. Through the courtesy of Miss Jocelyn Crane of the New York Zoological Society the specimen taken at Gardner Bay, Hood Island, by the *Arcturus* Expedition and recorded as *Xanthodius occidentalis* Boone (1927) was made available for examination and was found to agree substantially with Hancock specimens of *Leptodius occidentalis* from the Gulf of California.

*Remarks*.—Like its congeners, *L. cooksoni* and *snodgrassi*, *Leptodius occidentalis* is an intertidal species and would scarcely be taken "while diving in fifteen feet of water," as reported by an earlier expedition.

### ***Leptodius snodgrassi* Rathbun**

Plate 83, Fig. 1

*Leptodius snodgrassi* Rathbun, Proc. Washington Acad. Sci., vol. 4, p. 279, 1902; Bull. 152, U.S. Nat. Mus., p. 303, pl. 139, text fig. 47a and b, 1930. Finnegan, Journ. Linn. Soc. London, Zool., vol. 37, p. 631, 1931. Hult, Arkiv för Zoologi, Band 30A, no. 5, p. 13, 1938.

*Type locality*.—Black Bight, Albemarle Island.

*Type*.—USNM No. 24831.

*Range*.—Known only from the type locality and a nearby reef, (Hopkins-Stanford Expedition), and from Conway Bay, Indefatigable Island (Crossland).

*Diagnosis*.—Anterolateral margin thin, 5-toothed, including orbital tooth. Carapace with numerous transverse ridges. Outer surface of palm with longitudinal carinae.

*Material examined* (32 specimens from 7 stations).—

49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 11 specimens.

153-34. NE point of Narborough Island, shore, Jan. 14, 1934, 1 fragment.

168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 1 male, 3 females (1 ovig.).

314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 10 specimens.

811-38. Barrington Island, coral, Jan. 26, 1938, 1 male, 3 females.

811a-38. Barrington Island, *Pavona* coral, Jan. 26, 1938, 1 young male.

-38. Academy Bay, Indefatigable Island, shore, no date, collected by Karl Kübler, 1 male (photographed).

*Measurements*.—Largest specimen, broken male: length 13.7 mm, width 21.5 mm, cheliped (detached) 24.6 mm, chela 14.2 mm, dactyl 7.7 mm.

*Color in life*.—Carapace a patchwork of 4 distinct colors: rose, yellow green, purplish black, and light blue. Chelipeds rich Mars brown continued on fingers, tips of dactyls white. Ambulatory legs opalescent, predominately lavender, blue, brown, and yellow green. Dactyls bright lemon yellow. (Petersen)

*Habitat*.—Lower levels of rocky beach under lava boulders.

*Depth*.—Shore.

*Remarks*.—This species may be readily distinguished from the following *L. cooksoni* Miers by the carinate chelae, the areolate carapace, and the well-defined anterolateral teeth. Repeated searching has failed to reveal its presence in more than one locality, Academy Bay, in even moderate numbers. It is found at a considerably lower level of the beach than is *L. cooksoni*.

### ***Leptodius cooksoni* Miers**

Plate 77, Fig. 3; Plate 79, Fig. 3

*Leptodius cooksoni* Miers, Proc. Zool. Soc. London, p. 73, pl. 12, figs. 1-1d, 1877. Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 589, 1898; Bull. 152, U.S. Nat. Mus., p. 310, pl. 142, and synonymy, 1930. Boone, Zoologica, vol. 8, no. 4, p. 188, fig. 65, 1927. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 14, 1933. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Xanthodius lobatus* Rathbun, Zoologica, vol. 5, no. 14, p. 158, 1924.

Boone, Zoologica, vol. 8, no. 4, p. 191, fig. 66, 1927.

*Type locality*.—Charles Island, Galapagos Islands.

*Type*.—In Brit. Mus.



*Range*.—Clarion Island, Mexico (Anthony); Galapagos Islands (*Albatross*); Chile (A. Milne Edwards).

*Atlantic analogue*.—*L. parvulus* (Fabricius).

*Diagnosis*.—Anterolateral margin thick, lobed. Inner surface of palm making an abrupt angle with upper outer surface. Fingertips slightly spoon shaped.

*Material examined* (1,263 specimens from 53 stations).—

- 11-32. Conway Bay, Indefatigable Island, shore, Jan. 12, 1932, 3 males, 1 female.  
13-32. Darwin Bay, Tower Island, shore, Jan. 20, 1932, 7 males, 8 females.  
24-33. Gardner Bay, Hood Island, shore, Jan. 24, 1933, 5 specimens.  
27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 18 males, 22 females (3 ovig.), 7 young.  
30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 12 males, 8 females (7 ovig.), 1 young.  
33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 2 specimens.  
38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 5 males, 2 females (1 ovig.).  
42-33. Chatham Island, opposite Kicker Rock, shore, Jan. 31, 1933, 6 specimens.  
48-33. Barrington Island, shore, Feb. 2, 1933, 36 males, 47 females (28 ovig.), 1 young.  
49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 27 males, 32 females (21 ovig.).  
52-33. Academy Bay, Indefatigable Island, shore, Feb. 4, 1933, 32 males, 55 females (38 ovig.), 7 young.  
56-33. Flamingo Bay, Charles Island, shore, Feb. 5, 1933, 27 males, 44 females, (22 ovig.), 12 young.  
58-33. Cormorant Bay, Charles Island, shore, Feb. 6, 1933, 4 males, 4 females (2 ovig.).  
62-33. Black Bight, Albemarle Island, shore, Feb. 8, 1933, 24 males, 19 females (10 ovig.), 1 fragment.  
65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 1 specimen.  
69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 2 males, 3 females.  
71-33. James Bay, James Island, shore, Feb. 12, 1933, 6 males, 11 females.  
76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 6 specimens.

- 82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 49 males, 42 females, 10 young.
- 85-33. North Seymour Island, shore, Feb. 18, 1933, 10 males, 7 females, 2 young.
- 88-33. South Seymour Island, shore, Feb. 19, 1933, 110 specimens.
- 93-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 33 specimens.
- 96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 5 males, 9 females (1 young).
- 98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 6 specimens.
- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 1 specimen.
- 146-34. Albemarle Point, Albemarle Island, shore, Jan. 12, 1934, 12 males, 14 females (4 ovig.), 7 young.
- 153-34. NE point of Narborough Island, shore, Jan. 14, 1934, 4 specimens.
- 161-34. Black Beach, Charles Island, 3 fms, Jan. 17, 1934, 1 specimen.
- 163-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 1 specimen.
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 12 males, 9 females (2 ovig.).
- 174-34. South Seymour Island, shore, Jan. 22, 1934, 5 males (1 photographed), 8 females (6 ovig.).
- 175-34. North Seymour Island, shore, Jan. 22, 1934, 14 males, 15 females (7 ovig.), 5 young.
- 179-34. Bartholomew Island near James Island, shore, Jan. 23, 1934, 17 males, 20 females, 1 young.
- 184-34. James Bay, James Island, shore, Jan. 24, 1934, 4 specimens.
- 188-34. Cartago Bay, Albemarle Island, shore, Jan. 25, 1934, 6 males, 3 females.
- 199a-34. Post Office Bay, Charles Island, shore, Jan. 30, 1934, 4 specimens.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 22 males, 17 females, 1 young.
- 306-35. Marchena Island, shore, Dec. 2, 1934, 28 males, 22 females (9 ovig.).
- 312-35. Black Beach, Charles Island, shore, Dec. 5, 1934, 8 males, 17 females (12 ovig.).
- 314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 23 males, 30 females (19 ovig.), 2 young.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 6 males, 5 females (3 ovig.).
- 342-35. Bartholomew Island near James Island, shore, Dec. 12, 1934, 6 males, 3 females (2 ovig.).

- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1935, 3 specimens.  
351-35. South of Black Beach, Charles Island, shore, Dec. 14, 1934, 2 specimens.  
354-35. Wreck Bay, Chatham Island, shore, Dec. 15, 1934, 12 specimens.  
358-35. Gardner Bay, Hood Island, shore, Dec. 17, 1934, 8 males, 4 females.  
359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 21 males, 21 females, 3 young.  
782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 19 specimens.  
789-38. South Seymour Island, shore, Jan. 19, 1938, 1 male, 1 female.  
796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 4 males.  
800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 6 specimens.  
803-38. Black Beach, Charles Island, shore, Jan. 23, 1938, 2 males.  
808-38. Academy Bay, Indefatigable Island, shore, Jan. 25, 1938, 7 males, 8 females.

*Measurements*.—Largest specimen, male: length 17.6 mm, width 28.6 mm, cheliped 34.0 mm, chela 19.6 mm, dactyl 10.4 mm.

*Habitat*.—High tide level, under small rocks among pebbles.

*Depth*.—Shore to 3 fms.

*Remarks*.—*L. cooksoni* and *Mithrax (Mithraculus) nodosus* Bell, the first a cancrivore, the second a spider crab, could be taken plentifully at high tide, when most other species were under several feet of water. While, with the exception of the *Pocillopora*-dwelling *Trapezias*, *L. cooksoni* exceeded all other Galapagos brachyurans in number of specimens obtained, three other species were collected at a greater number of stations. The reason would seem to be that, whereas *Teleophrys cristulipes* Stimpson, *Eriphia granulosa* A. Milne Edwards, and *Mithrax (Mithraculus) nodosus* Bell occur in more than one habitat, *L. cooksoni* is closely restricted to the intertidal zone.

## Genus **LOPHOXANTHUS** A. Milne Edwards, 1879

### **Lophoxanthus lamellipes** (Stimpson)

Plate 77, Fig. 5

*Xantho lamellipes* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 205 (77), 1860.

*Lophoxanthus lamellipes* A. Milne Edwards, Crust. Reg. Mex., p. 256, pl. 46, figs. 3 and 3a, 1879. Rathbun, Bull. 152, U.S. Nat. Mus., p. 317, pl. 148, figs. 3 and 4, 1930. Hult, Arkiv för Zoologi, Band 30A, no. 5, p. 13, 1938.

*Type locality*.—Cape San Lucas, Lower California.

*Type*.—Cotypes in MCZ, No. 1254.

*Range*.—From La Paz, Lower California (Belding), to Salinas, Ecuador (Schmitt); Galapagos Islands (Hult).

*Diagnosis*.—Carapace flat, octagonal, anterolateral margin very thick between orbit and first of 3 laterally placed teeth. Ambulatory legs compressed, crested, eroded.

*Material examined* (129 specimens from 32 stations).—

- 27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 2 males, 2 females (1 ovig.).  
30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 3 males, 1 female.  
33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 8 males, 1 female.  
38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 1 male, 1 female.  
42-33. Chatham Island, opposite Kicker Rock, shore, Jan. 31, 1933, 1 male.  
47-33. Barrington Island, 2 fms, Feb. 2, 1933, 1 specimen.  
48-33. Barrington Island, shore, Feb. 2, 1933, 1 ovig. female.  
69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 4 males, 3 females.  
71-33. James Bay, James Island, shore, Feb. 12, 1933, 1 male, 1 female.  
73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 1 female.  
76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 3 males, 2 females.  
80-33. Duncan Island, shore, Feb. 15, 1933, 1 male, 1 female.  
88-33. South Seymour Island, shore, Feb. 19, 1933, 1 female.  
96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 1 female.  
101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 2 males.  
166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 1 female.  
168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 1 female.  
179-34. Bartholomew Island near James Island, shore, Jan. 23, 1934, 1 large male.  
199-34. Black Beach, Charles Island, shore, Jan. 30, 1934, 1 male.  
202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 4 males, 4 females.  
313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 1 female.  
314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 1 male, 3 females (1 ovig.).

- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 1 ovig. female.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 10 males (1 photographed), 5 females (2 ovig.).
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 6 males, 1 ovig. female.
- 350-35. South Seymour Island, shore, Dec. 13, 1934, 3 males, 2 females.
- 351-35. South of Black Beach, Charles Island, shore, Dec. 14, 1934, 1 male.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 15 males, 10 females.
- 782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 1 male.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 2 males, 2 females.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 6 males, 2 females.
- 800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 1 male, 1 female.

*Measurements*.—Largest specimen, male: length 8.3 mm, width 11.8 mm, cheliped (rigid) coxa to elbow 6.5 mm, elbow to tip of dactyl 10.0 mm, chela 10.0 mm, dactyl 5.8 mm.

*Color in life*.—Gastric, cardiac, and intestinal regions pale yellow ochre. Branchial area pale pinkish white. Frontal and anterolateral margins pale red orange. Chelipeds pale orange to white with a few reddish-orange spots on carpus and hand. Fingers a rich dark hazel brown with dull yellow tips. Ambulatory legs dull yellow shaded with Van Dyke red. (Petersen)

*Habitat*.—In coarse gravel near high tide level.

*Depth*.—Shore to 3 fms.

*Remarks*.—*L. lamellipes* is found with *Leptodius cooksoni* Miers and *Cycloxanthops vittatus* (Stimpson) in coarse gravel near high tide level. These three species appear to require less moisture than most of the Xanthidae.

### Genus **LOPHOPANOPEUS** Rathbun, 1898

#### **Lophopanopeus maculatus** Rathbun

Plate 78, Figs. 3, 4

*Lophopanopeus maculatus* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 588, pl. 40, figs. 10 and 11, 1898; Bull. 152, U.S. Nat. Mus., p. 330, text fig. 51, 1930.

*Type locality*.—Southern part of Gulf of California, 8 fms.

*Type*.—USNM No. 21585.

*Range*.—Magdalena Bay, Lower California (*Albatross*); Gulf of California (*Albatross*); 7-17 fms.

*Diagnosis*.—Chelipeds smooth, unequal. Carapace with 5 blunt teeth, the second depressed. Upper margins of meri of ambulatory legs spinulous. Tip of male abdomen broadly rounded.

*Material examined* (32 specimens from 9 stations).—

46-33. Barrington Island, 4-10 fms, Feb. 2, 1933, 1 ovig. female.

47-33. Barrington Island, 2 fms, Feb. 2, 1933, 1 ovig. female.

59-33. Off Cormorant Bay, Charles Island, Feb. 6, 1933, 2 males, 1 ovig. female.

69a-33. Albemarle Point, Albemarle Island, 12 fms, mud sample, Feb. 11, 1933, 1 female.

167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 2 males (1 photographed).

341-35. Sullivan Bay, James Island, 20 fms, Dec. 12, 1934, 2 males, 1 female.

355-35. West of Gardner Island, Hood Island, 12 fms, Dec. 17, 1934, 1 male, 1 young.

783-38. Darwin Bay, Tower Island, 40-70 fms, Jan. 16, 1938, 9 males.

785-38. Darwin Bay, Tower Island, 20-40 fms, Jan. 17, 1938, 10 males.

*Measurements*.—Largest specimen, male: length 7.0 mm, width 9.2 mm, cheliped 11.0 mm, chela 7.1 mm, dactyl 4.0 mm.

*Habitat*.—Sand and coral, sand and rock; rock, rock and algae.

*Depth*.—2-70 fms.

*Remarks*.—The Barrington Island and Charles Island specimens were compared with the type female, USNM No. 21585, and agree so closely that the name is applied without hesitation to Galapagos specimens. The female type is more ornamented throughout, the ornamentation consisting of a more spinulous orbit with a definite outer, as well as inner, notch. In the type specimen the third anterolateral tooth appears more prominent; in Hancock specimens, the fourth. The remainder of the *Albatross* specimens exhibit sufficient latitude in variation to encompass these slight discrepancies.

*L. maculatus* is now recorded from the Galapagos Islands.

Genus **HEXAPANOPEUS** Rathbun, 1898

***Hexapanopeus cartagoensis*** Garth

Plate 78, Figs. 5, 6

*Hexapanopeus cartagoensis* Garth, Allan Hancock Pac. Exped., vol. 5, no. 2, p. 17, pl. 6, figs. 1-4, 1939.

*Type locality*.—Cartago Bay, Albemarle Island, Galapagos Islands; 15-18 fms.

*Type*.—AHF no. 384.

*Range*.—Known only from the type locality.

*Diagnosis*.—Front oblique, lateral lobes prominent. First and second teeth fused, their combined width equal to that of third; fifth tooth reduced, almost postlateral. Major chela of adult male without superior crest.

*Material examined* (14 specimens from 3 stations).—

74-33. Cartago Bay, Albemarle Island, 3-6 fms, Feb. 14, 1933, 3 females (2 ovig.).

187-34. Cartago Bay, Albemarle Island, 8-10 fms, Jan. 25, 1934, 3 males, 7 females (4 ovig.).

799-38. Cartago Bay, Albemarle Island, 15-18 fms, Jan. 22, 1938, 1 male (holotype, AHF no. 384).

*Measurements*.—Male holotype: length 5.4 mm, width 7.3 mm, chela 6.4 mm; female allotype: length 3.9 mm, width 5.4 mm.

*Habitat*.—Sand bottom with occasional rock patches.

*Depth*.—3-18 fms.

*Remarks*.—One of the most localized members of the Galapagos brachyuran fauna, this tiny panopeid crab has been found only on the extensive flat bottom of Cartago Bay, the indentation from the east which separates Albemarle Island into two halves at Perry Isthmus. The only representative of its genus in the archipelago, it finds its nearest affinity in *H. costaricensis* Garth (1940) of the Central American mainland coast. Both species have the first and second anterolateral teeth fused.

Genus **EURYPANOPEUS** A. Milne Edwards, 1880

**Eurypanopeus transversus** (Stimpson)

*Panopeus transversus* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 210 (82), 1860.

*Eurypanopeus transversus* A. Milne Edwards, Crust. Reg. Mex., p. 319, pl. 59, figs. 1-1f, 1880. Boone, Zoologica, vol. 8, no. 4, p. 211, text fig. 76, 1927. Rathbun, Bull. 152, U.S. Nat. Mus., p. 407, pl. 172, figs. 5-7, 1930.

*Type locality*.—Panama.

*Type*.—Not extant.

*Range*.—From Mexico (A. Milne Edwards) to Paita, Peru (Jones); Galapagos Islands (*Noma*).

*Diagnosis*.—Carapace somewhat depressed posteriorly, curving downward anteriorly, front double edged. Anterolateral margin cut into 5 shallow lobes, the first two completely fused. A basal tooth on major dactyl; color of fingers continued on palm.

*Material examined*.—None from the Galapagos Islands. The Hancock collections contain a number of specimens collected at Callao and at the bays of San Juan and San Nicolas, Peru.

Genus **EURYTIUM** Stimpson, 1859  
**Eurytium affine** (Streets and Kingsley)

Plate 83, Fig. 2

*Panopeus affinis* Streets and Kingsley, Bull. Essex Inst., vol. 9, p. 106, 1877.

*Eurytium affine* A. Milne Edwards, Crust. Reg. Mex., p. 334, pl. 60, figs. 1-1c, 1880. Boone, Zoologica, vol. 8, no. 4, p. 213, fig. 77, 1927. Rathbun, Bull. 152, U.S. Nat. Mus., p. 425, pl. 177, figs. 1 and 2, 1930.

*Type locality*.—Not designated; one of Lockington's.

*Type*.—Not extant.

*Range*.—From Magdalena Bay, Lower California (Orcutt), and Gulf of California (*Albatross*) to Ecuador (?); Galapagos Islands (*Noma*).

*Diagnosis*.—Carapace broad, nearly flat, without transverse ridges. Anterolateral margins cut into 5 shallow teeth, the first two coalesced. Carapace widest opposite fifth pair of teeth. Frontal lobes with truncate outer lobules.

*Material examined*.—

49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 1 female (photographed).

*Measurements*.—Female: length 10.0 mm, width 15.0 mm, cheliped 18.7 mm, chela 10.2 mm, dactyl 5.5 mm.

*Habitat*.—Rocky shore.

*Depth*.—Shore.

*Remarks*.—Repeated searching over the same territory at Academy Bay has failed to reveal more specimens of this species, which belongs to the Gulf of California fauna.

Genus **MICROPANOPE** (Stimpson), 1871

KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Micropanope*

A<sup>1</sup> Carapace granulate, granules mostly in transverse lines

B<sup>1</sup> Chelae granulate; 3 prominent grooves on superior margin  
of manus . . . . . *M. xantusii*



- B<sup>2</sup> Chelae spinulous; manus without grooves, outer distal two-thirds smooth and bare . . . . . *M. fraseri*
- A<sup>2</sup> Carapace smooth and punctate posteriorly, granulate anteriorly.  
Chelae smooth, dissimilar; fingers of minor manus strongly deflexed . . . . . *M. polita*

### ***Micropanope xantusii* (Stimpson)**

Plate 77, Fig. 6

*Xanthodes xantusii* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 10, p. 105 (15), 1871.

*Micropanope xantusii* Rathbun, Bull. 152, U.S. Nat. Mus., p. 438, pl. 179, figs. 1-4, 1930. Crane, Zoologica, vol. 22, no. 3, p. 72, 1937.

*Pilumnus beebei* Boone, Zoologica, vol. 8, no. 4, p. 219; *not* fig. 80, which is a *Micropanope* of another species.

*Xanthias serrulata* Finnegan, Journ. Linn. Soc. London, vol. 37, p. 634, fig. 6, 1931.

*Type locality*.—Cape San Lucas, Lower California.

*Type*.—Not extant.

*Range*.—Arena Bank, Lower California (*Zaca*); Clarion Island (Hanna and Jordan); Galapagos Islands (*Arcturus*).

*Atlantic analogue*.—*M. truncatifrons* Rathbun.

*Diagnosis*.—Carapace covered with granulations arranged in transverse lines. Chelipeds coarse granulate, 3 prominent sulci on superior margin of manus. Five anterolateral teeth, the last plainly discernible.

*Material examined* (497 specimens from 38 stations).—

24-33. Gardner Bay, Hood Island, shore, Jan. 24, 1933, 7 males, 3 females.

27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 16 males, 17 females (7 ovig.).

28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 2 males.

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 17 males, 15 females.

33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 5 males, 2 females (1 ovig.).

38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 3 males, 1 ovig. female.

46-33. Barrington Island, 4-10 fms, Feb. 2, 1933, 1 female.

47-33. Barrington Island, 2 fms, Feb. 2, 1933, 1 male.

69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 20 males, 16 females.

- 71-33. James Bay, James Island, shore, Feb. 12, 1933, 1 male, 1 female.
- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 9 males, 13 females.
- 80-33. Duncan Island, shore, Feb. 15, 1933, 5 males, 8 females.
- 94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 38 males, 25 females (11 ovig.).
- 96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 1 male.
- 97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 23 males, 18 females.
- 98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 3 males, 5 females.
- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 7 males, 7 females.
- 101a-33. Darwin Bay, Tower Island, coral, Feb. 26, 1933, 4 males, 5 young.
- 163-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 5 females (2 ovig.).
- 166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 3 males, 1 ovig. female.
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 1 male, 2 females.
- 194-34. Post Office Bay, Charles Island, coral, from Onslow Island crater, Jan. 27, 1934, 13 males, 4 females.
- 197-34. Off Post Office Bay, Charles Island, 35-40 fms, Jan. 29, 1934, 1 male.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 11 males, 13 females (1 ovig.).
- 313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 1 female.
- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 18 males, 19 females (1 ovig.).
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 3 ovig. females.
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 8 males, 3 females (1 ovig.).
- 344-35. Bartholomew Island near James Island, shore, Dec. 12, 1934, 6 males, 3 females (2 ovig.).
- 350-35. South Seymour Island, shore, Dec. 13, 1934, 3 males, 2 females (1 ovig.).
- 357-35. Gardner Bay, Hood Island, coral, Dec. 17, 1934, 1 male.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 1 female.

- 782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 4 males, 2 females, 1 young.  
784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 3 males, 8 females, (2 ovig.).  
789-38. South Seymour Island, shore, Jan. 19, 1938, 7 males, 9 females.  
804-38. Onslow Island, near Charles Island, coral, Jan. 23, 1938, 4 males, 4 females.  
811-38. Barrington Island, coral, Jan. 26, 1938, 12 males (1 photographed), 19 females (10 ovig.).  
811a-38. Barrington Island, *Pavona* coral, Jan. 26, 1938, 3 young males.

*Measurements*.—Large male: length 8.4 mm, width 11.9 mm, cheliped (rigid) coxa to elbow 5.3 mm, elbow to tip of dactyl 9.8 mm, chela 8.8 mm, dactyl 4.5 mm.

*Habitat*.—*Pocillopora* colony.

*Depth*.—Shore and shoal water; occasionally to 40 fms.

*Remarks*.—While at the laboratories of the New York Zoological Society in 1937 the writer examined 3 male and 1 female specimens labeled "cotypes of *Pilumnus beebei*, Sta. 54, Hood Island, *Arcturus* Expedition, identified by L. Boone." These also carry the label "*Micropanope xantusii* (Stimpson), identified by M. J. Rathbun," which is unquestionably correct. A specimen in a separate bottle labeled "Sta. 54 *Arcturus*. Photo. Iden. Boone" (but not designated cotype) is of another species of *Micropanope*. In view of the fact that Boone's written description is based upon the specimens of *Micropanope xantusii* and these are the designated types, the writer follows Rathbun (1930) in considering *Pilumnus beebei* a synonym of Stimpson's species. The photographed specimen is described on page 462.

Through the courtesy of Dr. Isabella Gordon of the British Museum, a paratype of *Xanthias serrulata* Finnegan (1931) was examined and proved also to be identical with *Micropanope xantusii* (Stimpson).

### ***Micropanope polita* Rathbun**

Plate 77, Fig. 4

*Micropanope polita* Rathbun, Proc. U.S. Nat. Mus., vol. 16, p. 238, 1893; Bull. 152, U.S. Nat. Mus., p. 440, pl. 180, figs. 3 and 4, text fig. 40, and synonymy, 1930. Crane, Zoologica, vol. 22, no. 3, p. 71, 1937.

*Panopeus tanneri* Faxon, Bull. Mus. Comp. Zool., vol. 24, p. 154, 1893; Mem. Mus. Comp. Zool., vol. 18, p. 19, pl. 3, figs. 4 and 4a, 1895.

*Xanthias politus* Boone, Zoologica, vol. 8, no. 4, p. 210, fig. 75, 1927.

*Type locality*.—Off Magdalena Bay, Lower California; 36 fms.

*Type*.—Cotypes: USNM No. 17397; MCZ No. 4252.

*Range*.—Magdalena Bay, Lower California (*Albatross*); Galapagos Islands (*Albatross*); 20-66 fms.

*Atlantic analogue*.—*M. granulimanus* (Stimpson).

*Diagnosis*.—Front double edged, edges granulate, a small tooth at outer angle. Chelae smooth, the larger with a strong tooth at base of dactyl. Carapace smooth and punctate posteriorly, granulate anteriorly. Five anterolateral teeth. Legs spinulous above.

*Material examined* (722 specimens from 36 stations).—

- 143-34. Wenman Island, 100-150 fms, Jan. 11, 1934, 4 males, 2 females (1 ovig.).
- 147-34. Tagus Cove, Albemarle Island, 30 fms, Jan. 13, 1934, 7 males, 13 females (3 ovig.).
- 148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 13 males, 40 females (8 ovig.).
- 149-34. Tagus Cove, Albemarle Island, 20 fms, Jan. 13, 1934, 16 males, 17 females (7 ovig.), 4 young.
- 155-34. Tagus Cove, Albemarle Island, 50-60 fms, Jan. 15, 1934, 39 males, (1 photographed), 20 females.
- 157-34. Tagus Cove, Albemarle Island, 10-18 fms, Jan. 15, 1934, 4 males, 7 females (1 ovig.).
- 161-34. Black Beach, Charles Island, 3 fms, Jan. 17, 1934, 1 male.
- 167-34. Post Office Bay, Charles Island, 15 fms, Jan. 19, 1934, 59 males, 32 females (14 ovig.), 9 young.
- 168a-34. Academy Bay, Indefatigable Island, coral, Jan. 20, 1934, 1 young.
- 169-34. Academy Bay, Indefatigable Island, 15-25 fms, Jan. 20, 1934, 16 males, 12 females (4 ovig.), 45 young.
- 170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 1 male, 1 female.
- 171-34. East of Wreck Bay, Chatham Island, 35-40 fms, Jan. 21, 1934, 12 females.
- 177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 39 males, 16 females.
- 182-34. James Bay, James Island, 30 fms, Jan. 24, 1934, 4 males, 9 females (3 ovig.), 22 young.
- 183-34. James Bay, James Island, 50-70 fms, Jan. 24, 1934, 12 males, 5 females, 4 young.
- 190-34. Lat. 0° 55' S, Long. 90° 30' W, 58-60 fms, Jan. 26, 1934, 25 males, 20 females (6 ovig.).

- 193-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 27, 1934, 60 males, 22 females (2 ovig.).
- 197-34. Off Post Office Bay, Charles Island, 35-40 fms, Jan. 29, 1934, 3 males, 4 young.
- 201-34. Off Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 8 males, 15 females (8 ovig.).
- 317-34. Off Gordon Rocks, Indefatigable Island, 25-30 fms, Dec. 8, 1934, 1 male.
- 324-35. Tagus Cove, Albemarle Island, 45 fms, Dec. 10, 1934, 3 males, 4 females.
- 328-35. Tagus Cove, Albemarle Island, 14 fms, Dec. 10, 1934, 1 female.
- 336-35. Sullivan Bay, James Island, 20 fms, Dec. 12, 1934, 7 specimens.
- 339-35. Sullivan Bay, James Island, 10 fms, Dec. 12, 1934, 1 male.
- 340-35. Sullivan Bay, James Island, 8 fms, Dec. 12, 1934, 1 male, 2 females (1 ovig.).
- 341-35. Sullivan Bay, James Island, 20 fms, Dec. 12, 1934, 1 male.
- 346-35. Between South Seymour and Daphne Islands, 55 fms, Dec. 13, 1934, 2 young.
- 352-35. Wreck Bay, Chatham Island, 35 fms, Dec. 15, 1934, 1 male, 4 females.
- 355-35. Gardner Bay, Hood Island, 12 fms, Dec. 17, 1934, 1 young.
- 356-35. Gardner Bay, Hood Island, 12-15 fms, Dec. 17, 1934, 1 female.
- 788-38. SE of Daphne Major Island, 55 fms, Jan. 19, 1938, 1 young.
- 795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 16 males, 24 females.
- 795a-38. Sullivan Bay, James Island, 50-60 fms, Jan. 21, 1938, 4 males.
- 807-38. Academy Bay, Indefatigable Island, 10-25 fms, Jan. 24, 1938, 1 male.
- 810-38. (D-1) Barrington Island, 48 fms, Jan. 26, 1938, 1 male.
- 816-38. North of Hood Island, 50-100 fms, Jan. 29, 1938, 2 males.

*Measurements.*—Large male: length 7.5 mm, width 10.4 mm, cheliped 14.4 mm, chela 8.0 mm, dactyl 4.5 mm.

*Color in life.*—Ground color of carapace ivory yellow overcast with cadmium orange. Granules on frontal area bright red. Cheliped like carapace, but a little more red. Fingers light clay color with reddish tint; dark red at base of movable finger fading to light at tip. Eyes black. (Petersen)

*Habitat.*—Bottom rock, coral, nullipore, bryozoa, and, in one case, mud.

*Depth.*—3-150 fms.

*Remarks.*—Almost infinite variation is exhibited by the exhaustive series of this species obtained at a great range of depths and on a variety of bottoms. Only a few of them are as well developed as the type of *Panopeus tanneri* Faxon (USNM No. 20606), a synonym of *M. polita*, from 66 fms, Cocos Island, with which they were compared. Distinct beads on the carapace and chelipeds are characteristic. It is perhaps significant that these are Wenman Island specimens, also deep water, and nearest to Cocos Island. A second careful sorting under the binocular of the 800 specimens revealed a number of the very similar young of *Lophopanopeus maculatus* Rathbun, a new record for the archipelago.

***Micropanope fraseri*, new species**

Plate 57, Figs. 1-4

*Pilumnus beebei* Boone, Zoologica, vol. 8, no. 4, 1927, p. 220, text fig. 80 only; not pp. 219-221, exclusive of text-fig. 80, which is *Micropanope xantusii* (Stimpson).

*Type.*—Male, holotype, and female, allotype, AHF no. 331, Allan Hancock Foundation, The University of Southern California, from Black Beach Anchorage, Charles Island, Galapagos Islands, shore; January 27, 1933; collected by Allan Hancock Expedition of 1933 at *Velero* station 33-33. The remaining specimens, paratypes, are considered under *Materiæ examined*.

*Measurements.*—Male holotype: length of carapace 7.4 mm, width 11.1 mm, length of major cheliped 13.5 mm, of major chela 8.3 mm, of major dactyl 4.6 mm; female allotype: length 7.0 mm, width 10.0 mm.

*Diagnosis.*—Five anterolateral spines, including the postorbital, the second existing as a cluster of spinules. A similar cluster on the subhepatic region. Granules of the manus of the major chela terminating in an oblique line, leaving the outer distal two-thirds smooth and bare.

*Description.*—Carapace one-third wider than long, smooth, flat, regions faintly indicated, microscopically pubescent anteriorly, completely naked posteriorly, front visible in dorsal view. Frontal lobes obliquely truncate, bordered with acute granules, a shallow sulcus extending from the mesogastric region to the well-defined median V. Orbits spinulose above and below; two well-marked sulci above. Five anterolateral spines, including the postorbital, the second existing as a cluster of spinules, the posterior three largest, anteriorly directed, and with outer edges serrate, their interspaces U-shaped, the greatest distance between spines 3 and 4. A cluster of subhepatic spinules.

Chelipeds clothed with short, soft hairs, interspersed occasionally with longer hairs. Upper surface of major carpus and manus covered with acuminate granules, which become flattened distally and terminate in an oblique line across the manus, leaving the outer distal two-thirds of the hand smooth and bare. Fingers stout, slightly gaping, pollex somewhat deflexed, an enlarged tooth at base of dactyl, a prominent lobe at basal two-fifths of fixed finger; color of fingers not continued on palm. Minor carpus and manus covered with hairs and acuminate granules extending onto the pollex, fingers slender, deflexed, grooved, acuminate, their tips crossing when closed.

Merus of ambulatory legs spinulose, carpus grooved and spinulose, carpus, propodus, and dactylus with long hairs; dactyli with incurving, horny tips.

Segments 3-4-5 of male abdomen coalesced, sixth segment broadly rectangular, seventh triangular with a rounded tip.

Merus of outer maxilliped roughly rectangular, anterolateral angle broadly rounded, almost lobate, inner margin minutely spinulose, antero-internal angle with a shallow notch for insertion of the 3-jointed palpus.

*Material examined* (469 specimens from 37 stations).—

24-33. Gardner Bay, Hood Island, shore, Jan. 24, 1933, 4 males, 6 females.

28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 3 males, 3 females.

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 1 female.

33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 3 males, 2 females.

38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 1 young.

47-33. Barrington Island, 2 fms, Feb. 2, 1933, 2 males, 1 female.

48-33. Barrington Island, shore, Feb. 2, 1933, 1 male, 1 female.

69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 5 males, 2 females.

73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 29 specimens.

76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 43 males, 19 females (1 ovig.) 19 young.

80-33. Duncan Island, shore, Feb. 15, 1933, 14 males, 7 females, 11 young.

94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 2 females.

96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 1 male, 1 female.

- 98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 2 males, 3 females.
- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 1 male, 2 females.
- 163-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 2 males.
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 6 males, 5 females.
- 175-34. North Seymour Island, shore, Jan. 22, 1934, 1 female.
- 194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 5 males.
- 199-34. Black Beach, Charles Island, shore, Jan. 30, 1934, 1 male.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 5 males, 5 females (3 ovig.).
- 313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 3 males, 2 females.
- 314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 2 males, 6 females (3 ovig.).
- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 5 males, 4 females (2 ovig.), 7 young.
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 4 males, 7 females (3 ovig.), 4 young.
- 350-35. South Seymour Island, shore, Dec. 13, 1934, 1 male, 1 ovig. female.
- 351-35. South of Black Beach, Charles Island, shore, Dec. 14, 1934, 2 young males.
- 357-35. Gardner Bay, Hood Island, coral, Dec. 17, 1934, 3 males, 2 females.
- 358-35. Gardner Bay, Hood Island, shore, Dec. 17, 1934, 2 males, 3 females (2 ovig.), 2 young.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 22 males, 16 females, 2 young.
- 784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 1 male.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 6 males, 7 females.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 4 males, 7 females.
- 800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 2 males, 2 females.
- 804-38. Onslow Island, near Charles Island, coral, Jan. 23, 1938, 1 male, 1 female, 1 young.
- 811-38. Barrington Island, coral, Jan. 26, 1938, 55 males, 42 females, 16 young.



811a-38. Barrington Island, *Pavona* coral, Jan. 26, 1938, 1 young male

*Color in life*.—Ground color of carapace pale vinaceous russet with pale violet purple tint on intestinal and branchial areas, gradually blending into very strong violet purple on other areas. Tips of marginal teeth light. Numerous small and a few large blotches of bluish white. Cheliped like carapace but violet purple color much more intense. Fingers black; tips brownish white. Ambulatory legs with pale blue and white blotches more in evidence, almost in bands. Dactyl white, nail yellow. (Petersen)

*Habitat*.—Shore, under rocks; *Pocillopora* coral.

*Remarks*.—The largest male from the first Charles Island shore station (the type) was compared with the specimen figured as *Pilumnus beebei* Boone (1927, fig. 80) and agrees with it in every particular. Since the photographed specimen was not the type, and since the written description is of a different species and has page precedence over the figure, the writer follows Rathbun (1930) in considering the Boone species a synonym of *Micropanope xantusii* (Stimpson). (See also remarks under this species.)

This distinctive species is named for Dr. C. McLean Fraser.

Genus **TETRAXANTHUS** Rathbun, 1898

**Tetraxanthus rathbunae** Chace (tentative)

Plate 80, Fig. 1

Not *Xanthodes bidentatus* A. Milne Edwards, Crust. Reg. Mex., p. 353, pl. 53, figs. 5-5b, 1880.

*Tetraxanthus bidentatus* Rathbun, Bull. Lab. Nat. Hist. State Univ. Iowa, vol. 4, p. 275, 1898; Bull. 152, U.S. Nat. Mus., p. 458, pl. 184, 1930.

*Tetraxanthus rathbunae* Chace, Mem. de la Soc. Cubana de Hist. Nat., vol. 13, no. 1, p. 52, 1939. Torreia, no. 4, p. 37, 1940.

*Type locality*.—Old Bahama Channel due north of Punta Caldera, Camaguey Province, Cuba, 150-180 fms.

*Type*.—MCZ No. 10213.

*Range*.—From off Cape Lookout, North Carolina (*Albatross*), to off Cape Frio, Brazil (*Albatross*); 15-260 fms. (Chace)

*Diagnosis*.—Carapace very convex, regions not indicated. Four lateral teeth, of which the first two are inconspicuous, the last two wide and blunt. Front not sharply demarcated from internal orbital angles. A lobe on carpus of cheliped at inner angle. Legs spindly. Tips of fingers crossing.

*Material examined.*—

58-33. Cormorant Bay, Charles Island, not over 13 fms, Feb. 6, 1933,  
1 young female (photographed).

*Measurements.*—Female: length 6.3 mm, width 7.8 mm, cheliped  
9.5 mm, chela 5.0 mm, dactyl 3.0 mm.

*Depth.*—The Galapagos specimen was dredged in not over 13 fms.

*Remarks.*—The sending of this unique specimen in Hancock collections to Dr. Fenner A. Chace for comparison with the type of *Xanthodes bidentatus* A. Milne Edwards resulted in a complete review of the Atlantic species of *Tetraxanthus* by Dr. Chace, involving the suppression of *T. rugosus* Rathbun (1930) and the establishment of *T. bidentatus* Rathbun (1898) as *T. rathbunae* Chace with recent *Atlantis* material for types.

The Galapagos specimen, though differing in minor particulars, is tentatively referred to the latter species until more material is available on which to base a Pacific species of *Tetraxanthus*.

Genus **ECTAESTHESIUS** Rathbun, 1898

**Ectaesthesius bifrons** Rathbun

Plate 58, Figs. 1-7

*Ectaesthesius bifrons* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 591, pl. 42, figs. 12-14, 1898; Bull. 152, U.S. Nat. Mus., p. 460, text fig. 76a-c, 1930.

*Type locality.*—Off Chatham Island, Galapagos Islands; 45 fms.

*Type.*—USNM No. 21586.

*Range.*—Known only from the type locality.

*Diagnosis.*—Carapace smooth and glabrous, anterior margins bidentate, posterior margins strongly converging. Orbits completely closed. Fingers long and tapering. Legs with last three segments hairy; dactyls as long as propodi.

*Material examined* (9 specimens from 4 stations).—

346-35. South Seymour Island, 55 fms, Dec. 13, 1934, 1 male.

795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 2 males  
(1 illustrated), 1 female (illustrated in part), 2 young.

795a-38. Sullivan Bay, James Island, 50-60 fms, Jan. 21, 1938, 1 female,  
1 young.

814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 1 female.

*Measurements.*—Largest male: length 9.3 mm, width 12.9 mm, cheliped 19.0 mm, chela 11.8 mm, dactyl 6.4 mm; female: length 8.2 mm, width 11.4 mm.

*Habitat.*—Sand and rock, sand and shell, mud and shell.

*Depth.*—20-60 fms.

*Remarks.*—This *Trapezia*-like xanthid was not encountered by the earlier Allan Hancock Expeditions, and it remained for the cruise of 1938 to turn it up in any numbers. The finding of 2 males, 2 females, and 3 young in Sullivan Bay, James Island, proves that it must occur with some frequency on the right type of bottom, which in this case was sand with some rock.

*E. bifrons* is now known to occur at two localities, James and Seymour, other than the type locality, Chatham. The first male specimen has also been found.

*Description of the male.*—The description of *Ectaesthesius bifrons* as given by Rathbun for the female is applicable to the male with the following exceptions:

1. In the female, the major and minor chelae are apparently alike and are similar to the minor chela of the male. The major chela of the male is higher than the minor and more swollen. The dactylus is considerably shorter than the superior margin of the palm. The inferior margin is less sinuous than that of the minor chela and is almost straight. The pollex is short and thick, bearing on its inner margin a raised ridge which may represent 2 low teeth worn down to their bases. The tips of the fingers are blunt, incurving, that of the fixed finger having a hooked appearance.

2. The male abdomen has 7 free segments, as has the female, a fact which should be mentioned in the generic description. The first two segments are narrow, the third is widest, its edges broadly convex, the fourth and fifth segments narrowing anteriorly, the sixth rectangular, almost square, and the seventh broadly rounded. All 7 segments are fringed with hair.

3. There is a tiny papilla on the inner distal margin of the merus of the cheliped.

Genus **PARAXANTHIAS** Odhner (part), 1925

**Paraxanthias insculptus** (Stimpson)

Plate 78, Figs. 1, 2

*Xanthodes insculpta* Stimpson, Ann. Lyc. Nat. Hist., New York, vol. 10, p. 105 (15), 1871.

*Pilumnoides pusillus* Rathbun, Proc. Washington Acad. Sci., vol. 4, p. 281, pl. 12, figs. 9 and 10, 1902. Boone, Zoologica, vol. 8, no. 4, p. 215, fig. 78, 1927.

*Xanthias insculpta* Rathbun, Zoologica, vol. 5, p. 157, fig. 38, 1924. Boone, Zoologica, vol. 8, no. 4, p. 207, figs. 74A and B, 1927. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 634, 1931.

*Paraxanthias insculptus* Rathbun, Bull. 152, U.S. Nat. Mus., p. 468, pl. 189, fig. 4, text fig. 77a-b, 1930. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 16, 1933.

*Type locality*.—Cape San Lucas, Lower California.

*Type*.—Not extant.

*Range*.—Cape San Lucas, Lower California; Galapagos Islands (Hopkins-Stanford Expedition).

*Diagnosis*.—Carapace subhexagonal, areolate, anterolateral margins with 4 lobes. Chelipeds nodulous, color of fingers continued on palm of adult male.

*Material examined* (156 specimens from 39 stations).—

- 24-33. Gardner Bay, Hood Island, shore, Jan. 24, 1933, 2 males.
- 25-33. Gardner Bay, Hood Island, dredged, Jan. 24, 1933, 3 males, 2 females (1 ovig.).
- 27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 7 males, 8 females (5 ovig.), 3 young.
- 28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 1 male, 1 female, 2 young.
- 30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 1 male.
- 33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 10 males (1 photographed), 8 females (5 ovig.), 1 young.
- 46-33. Barrington Island, 4-10 fms, Feb. 2, 1933, 9 young.
- 47-33. Barrington Island, 2 fms, Feb. 2, 1933, 4 young.
- 49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 1 specimen.
- 59-33. Off Cormorant Bay, Charles Island, 13 fms, Feb. 6, 1933, fragment.
- 66-33. Tagus Cove, Albemarle Island, 10-20 fms, Feb. 9, 1933, 1 young.
- 68-33. South of Cape Berkeley, Albemarle Island, shore, Feb. 10, 1933, 1 young.
- 69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 1 male.
- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 2 males.
- 76-33. Cartago Bay, Albemarle Island, shore, Feb. 4, 1933, 3 males.
- 80-33. Duncan Island, shore, Feb. 15, 1933, 3 males and a fragment.
- 94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 1 male.
- 98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 1 male.
- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 1 female.
- 152-34. Tagus Cove, Albemarle Island, coral, Jan. 14, 1934, 2 males.

- 161-34. Black Beach, Charles Island, 3 fms, Jan. 17, 1934, 1 male, 1 ovig. female.
- 163-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 1 ovig. female.
- 166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 2 males, 1 female.
- 169-34. Academy Bay, Indefatigable Island, 15-25 fms, Jan. 20, 1934, 1 young.
- 170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 2 specimens.
- 173-34. South Seymour Island, 5 fms, Jan. 22, 1934, 1 male.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 4 males.
- 313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 1 male, 1 ovig. female.
- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 20 males, 8 females (6 ovig.).
- 329-35. Tagus Cove, Albemarle Island, 10 fms, Dec. 10, 1934, 1 young.
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 4 males, 5 females (4 ovig.), 4 young.
- 350-35. South Seymour Island, shore, Dec. 13, 1934, 1 ovig. female.
- 357-35. Gardner Bay, Hood Island, shore, Dec. 17, 1934, 1 specimen.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 4 males, 1 female.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 3 males, 2 females, 1 young.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 1 female.
- 804-38. Onslow Island, near Charles Island, coral, Jan. 23, 1938, 1 male, 2 females.
- 807-38. Academy Bay, Indefatigable Island, 10-25 fms, Jan. 24, 1938, 1 young female.
- 811-38. Barrington Island, coral, Jan. 26, 1938, 3 males, 3 females.

*Measurements.*—Largest specimen, male: length 10.4 mm, width 15.0 mm, cheliped 16.0 mm, chela 11.0 mm, dactyl 6.1 mm.

*Color in life.*—General appearance of crab light ochre red. Chelipeds light purplish mineral red. Fingers dark sorghum brown fading toward almost white tips. Frontal, gastric, cardiac, and intestinal areas a tone darker than branchial areas. A few bluish white spots scattered over carapace, especially along regional grooves. Ambulatory legs with ground color of chelae but speckled with bluish white spots. Dactyl yellow, nail dark yellow. (Petersen)

*Habitat*.—Rocky shore.

*Depth*.—Shore; occasionally to 32 fms.

*Remarks*.—This series is remarkable for the small size of the ovigerous females as compared to the adult males. Females less than 6 mm long were found with the full complement of eggs. The conspicuous extension of the black on the fingers backwards on the palm, given by Boone (1927) as diagnostic of *Xanthias insculpta*, appears from Hancock series to occur only in large males. In females and smaller males it is chopped off abruptly at the base of the fingers or extends but slightly on the palm. A large male examined by the writer checks exactly with the proportions given for the type of *X. insculpta*.

The young of this species is difficult to distinguish from the young of *Xanthodius stimpsoni* (A. Milne Edwards), of the mainland coast; in fact, one Galapagos specimen so labeled was found in the collections of the U.S. National Museum. Since it is altogether possible that *X. stimpsoni* may occur in the Galapagos area, future collectors should examine with particular care their series of *P. insculptus*.

### Genus **MENIPPE** de Haan, 1833

#### **Menippe obtusa** Stimpson

Plate 82, Figs. 3, 4

*Menippe obtusa* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 53 (7), 1860. Rathbun, Bull. 152, U.S. Nat. Mus., p. 478, pl. 197; pl. 198, figs. 1 and 2, 1930. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 16, 1933.

*Type locality*.—Panama.

*Type*.—USNM No. 2050.

*Range*.—Pacific side of Costa Rica and Panama (Sternbergh); Floreana (Charles) Island, Galapagos (Sivertsen).

*Diagnosis*.—Anterolateral borders strongly arched; 5 broad teeth, including orbital; second tooth bilobate. Chelipeds massive, a stridulating ridge on inner surface of chela. But one lobule on frontal margin adjoining each submedian lobe.

*Material examined* (19 specimens from 8 stations).—

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 4 females.

38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 2 males, 1 female.

71-33. James Bay, James Island, shore, Feb. 12, 1933, 4 females.

73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 1 male.

166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 1 female.

174-34. South Seymour Island, shore, Jan. 22, 1934, 2 females.

359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 2 males, 1 young.

789-38. South Seymour Island, shore, Jan. 19, 1938, 1 large male (photographed).

*Measurements*.—Largest specimen, male: length 40 mm, width 59 mm, cheliped (rigid) coxa to elbow 41 mm, elbow to tip of dactyl 57 mm, chela 52 mm, height 29 mm, dactyl 27.5 mm.

*Habitat*.—Under rocks at low tide.

*Depth*.—Shore.

*Remarks*.—A specimen from Hood Island was compared with the type (USNM No. 2050) collected by Sternbergh. Stridulating ridges on the inner side of the palm are a remarkable characteristic of the genus. They play upon certain of the anterolateral teeth and appear capable of producing sound. (See illustration.)

### Genus **PILUMNUS** Leach, 1815

#### KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Pilumnus*

- A<sup>1</sup> Lateral margin with 5 spines, including orbital; size large . . . . . *P. xantusii*  
 . . . . .  
 A<sup>2</sup> Lateral margin with 5 teeth, including orbital; size minute . . . . . *P. pygmaeus*  
 . . . . .

### ***Pilumnus xantusii*** Stimpson

Plate 59, Figs. 1-5; Plate 79, Fig. 4

*Pilumnus xantusii* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 213 (85), 1860. Rathbun, Bull. 152, U.S. Nat. Mus., p. 486, pl. 201, figs. 1-3, 1930.

*Eriphides hispida* Boone, Zoologica, vol. 8, no. 4, p. 237, fig. 87B, 1927; (not fig. 87A, which is *E. hispida*).

*Pilumnus crosslandi* Finnegan, Journ. Linn. Soc. London, vol. 37, p. 643, 1931.

*Type locality*.—Cape San Lucas, Lower California.

*Types*.—Cotypes in Paris Mus. and MCZ, No. 1259.

*Range*.—Cape San Lucas, Lower California (Xantus); Galapagos Islands (as *P. crosslandi* Finnegan), (Crossland).

*Atlantic analogue*.—*P. sayi* Rathbun.

*Diagnosis*.—Five anterolateral spines including exorbital. Outer surface of major manus completely roughened. Meri of ambulatory legs entire. Carapace narrow; proportion of length to width 5:6. Carapace and chelipeds covered with long hairs.

*Material examined* (33 specimens from 9 stations).—

- 69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 3 males, 1 female.  
94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 1 male, 2 ovig. females.  
97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 3 males, 5 ovig. females.  
101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 1 ovig. female.  
101a-33. Darwin Bay, Tower Island, coral, Feb. 26, 1933, 1 ovig. female.  
152-34. Tagus Cove, Albemarle Island, coral, Jan. 14, 1934, 4 males (1 illustrated in part), 6 females (1 illustrated), 1 young.  
322-35. Tagus Cove, Albemarle Island, 10 fms, Dec. 10, 1934, 1 specimen.  
344-35. Bartholomew Island near James Island, coral, Dec. 12, 1934, 1 male, 2 females.  
796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 1 male.  
Also a paratype of *P. crosslandi* Finnegan and the specimen identified as *Eriphides hispida* by Boone (photographed).  
*Measurements*.—Largest specimen, female: length 17.6 mm, width 22.0 mm, cheliped 24.0 mm, chela 13.7 mm, dactyl 8.8 mm.  
*Habitat*.—Shore, the *Pocillopora* colony, or dredged (10 fms).  
*Depth*.—Shore to 10 fms.

*Remarks*.—A paratype of *Pilumnus crosslandi* Finnegan (1931) was examined through the courtesy of Dr. Isabella Gordon of the British Museum and later referred to Dr. Fenner A. Chace of Harvard MCZ for comparison with cotypes of Stimpson's *P. xantusii*. Dr. Chace finds agreement in all points but the degree of armature of the upper orbit, a character variable in the 8 cotypes at hand. In all other respects he reports the species indistinguishable.

Through the courtesy of Miss Jocelyn Crane of the New York Zoological Society, the specimen figured by Boone (1927, fig. 87B) as *Eriphides hispida*, young, has been examined and found to be a well-developed male specimen of *Pilumnus xantusii*.

### ***Pilumnus pygmaeus* Boone**

Plate 80, Fig. 4

*Pilumnus pygmaeus* Boone, Zoologica, vol. 8, no. 4, p. 221, fig. 81, 1927.  
Rathbun, Bull. 152, U.S. Nat. Mus., p. 515, pl. 207, figs. 4 and 5, 1930.



*Type locality*.—Off Hood Island, Galapagos Islands; 15 ft.

*Type*.—In Mus. N.Y. Zool. Soc.

*Range*.—Hood and Tower Islands, Galapagos Islands (*Arcturus*).

*Diagnosis*.—Of minute size. Carapace and chelipeds granulate. Anterolateral margins toothed, not spinulose; teeth obscure. Major chela twice the size of minor, hairy.

*Material examined* (138 specimens from 28 stations).—

- 27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 1 male (photographed), 1 female.  
28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 1 male, 3 females (1 ovig.).  
31-33. Gardner Bay, Hood Island, 4 fms, Jan. 26, 1933, 1 ovig. female.  
38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 3 females.  
47-33. Barrington Island, 2 fms, Feb. 2, 1933, 2 males, 2 females.  
59-33. Off Cormorant Bay, Charles Island, 13 fms, Feb. 6, 1933, 1 male, 8 females.  
65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 1 young.  
69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 1 young.  
76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 2 males.  
94-33. Darwin Bay, Tower Island, 2-3 fms, Feb. 22, 1933, 1 young male.  
97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 1 male.  
101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 1 ovig. female.  
101a-33. Darwin Bay, Tower Island, coral, Feb. 26, 1933, 1 ovig. female.  
152-34. Tagus Cove, Albemarle Island, coral, Jan. 14, 1934, 1 young male.  
161-34. Black Beach, Charles Island, 3 fms, Jan. 17, 1934, 2 females (1 ovig.).  
168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 1 female.  
169-34. Academy Bay, Indefatigable Island, 15-25 fms, Jan. 20, 1934, 15 males, 3 young.  
193-34. Post Office Bay, Charles Island, 8-10 fms, Jan. 27, 1934, 1 specimen.

- 194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 3 males, 6 females.  
306-35. Marchena Island, shore, Dec. 2, 1934, 6 young.  
315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 3 males, 1 female.  
333-35. James Bay, James Island, shore, Dec. 11, 1934, 1 male, 1 ovig. female.  
343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 1 male.  
357-35. Gardner Bay, Hood Island, coral, Dec. 17, 1934, 17 males, 13 females.  
789-38. South Seymour Island, shore, Jan. 19, 1938, 1 female.  
804-38. Onslow Island, near Charles Island, coral, Jan. 23, 1938, 10 males, 14 females.  
811-38. Barrington Island, coral, Jan. 26, 1938, 4 males.  
811a-38. Barrington Island, *Pavona* coral, Jan. 26, 1938, 1 male.

*Measurements*.—Length 2.5 mm, width 3.3 mm.

*Color in life*.—Carapace warm blackish brown with scattered small irregular patches of creamy white to pale blue. A large posterolateral area of white with an adjoining band of reddish ochraceous orange. Cheliped lighter than carapace and covered with small granules of light purplish vinaceous color. Outer surface covered with long coarse green hair. Ground color of ambulatory legs same as carapace but almost covered with irregular patches of creamy white with pinkish tone. Hair on legs pale yellowish white. (Petersen)

*Habitat*.—Shore, *Pocillopora* colony, and shallow dredging.

*Depth*.—Shore to 13 fms.

*Remarks*.—While secured more abundantly in the *Pocillopora* coral, *P. pygmaeus* is also gathered in ordinary shore collecting, where it is likely to be overlooked because of its infinitesimal size. Those at Barrington were obtained by use of the diving helmet, those in Cormorant Bay by shallow dredging.

### Genus **ACIDOPS** Stimpson, 1871

#### **Acidops fimbriatus** Stimpson

Plate 80, Fig. 3

*Acidops fimbriatus* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 10, p. 111 (21), 1871. Rathbun, Bull. 152, U.S. Nat. Mus., p. 534. 1930. (part: not the Australian specimen).

*Type locality*.—Cape San Lucas, Lower California.

*Type*.—Not extant.

*Range*.—Cape San Lucas, Lower California; also from Ecuador, if Rathbun's synonymy of *Ceratoplax ciliata* Canó be accepted.

*Diagnosis*.—Eystalks elongate, compressed. Front fringed with long, golden hair. Four teeth including orbital; teeth not produced. Chelipeds hairy and with granulate ridges.

*Material examined* (6 specimens from as many stations).—

73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 1 large female.

101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 1 male (photographed).

170-34. East of Wreck Bay, Chatham Island, 32 fms, Jan. 21, 1934, 1 specimen.

783-38. Darwin Bay, Tower Island, 40-70 fms, Jan. 16, 1938, 1 male.

785-38. Darwin Bay, Tower Island, 20-40 fms, Jan. 17, 1938, 1 female.

811-38. Barrington Island, coral, Jan. 26, 1938, 1 female.

*Measurements*.—Largest specimen, male: length 11.0 mm, width 14.4 mm, cheliped (rigid) coxa to elbow 7.0 mm, elbow to end of dactyl 7.5 mm, chela 6.5 mm, dactyl 4.1 mm; female: length 10.0 mm, width 13.5 mm.

*Color in life*.—Ground color of carapace white with bluish tinge, densely covered with hair of a light, pale yellow tint. Scattered all over are long hairs of bright red color to vermilion with light yellow to white tips. An irregular spot of yellow orange on cardiac region, a vermilion spot on gastric region, and a darker spot on branchial region. Cheliped overcast with vermilion spots and covered with long hairs like those of carapace. Carpus of ambulatory legs with tiny spots like those of cheliped; legs clothed with hair similar to that of carapace. Dactyls pale yellow. (Petersen)

*Habitat*.—Rocky shore; coral; sand bottom.

*Depth*.—Shore to 70 fms.

*Remarks*.—In the absence of Stimpson's type, or material from the Gulf of California, it is a moot question whether the Galapagos specimens are what Stimpson had. Certainly they are not the same as the Australian specimen which Rathbun (1930, p. 534, pl. 215) considered conspecific with the Stimpson specimen. Judging from the increasing number of species known to be common to both Gulf of California and Galapagos waters, the writer considers it much more probable that the above series represents the true *Acidops fimbriatus* than does the Australian specimen.

Genus **OZIUS** Milne Edwards, 1834KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Ozius*

- A<sup>1</sup> Carapace less than  $1\frac{1}{2}$  times as wide as long . . . *O. verreauxii*  
 A<sup>2</sup> Carapace more than  $1\frac{1}{2}$  times as wide as long  
     B<sup>1</sup> Chelae not strikingly dissimilar. Anterolateral margins  
         broadly arched . . . . . *O. peraltus*  
     B<sup>2</sup> Fingers of minor chela extremely attenuate. Anterolateral  
         margins almost straight . . . . . *O. tenuidactylus*

***Ozius verreauxii*** Saussure

Plate 81, Fig. 3; Plate 82, Figs. 5, 6

*Ozius verreauxii* Saussure, Rev. Mag. Zool., ser. 2, vol. 5, p. 359 (6), pl. 12, fig. 1, 1853. Faxon, Mem. Mus. Comp. Zool., vol. 18, p. 21, 1895. Rathbun, Bull. 152, U.S. Nat. Mus., p. 540, pl. 219; pl. 220, fig. 5, and synonymy, 1930. Boone, Zoologica, vol. 8, no. 4, p. 223, fig. 82, 1927. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 17, 1933.

*Type locality*.—Mazatlan, Mexico.

*Type*.—Not extant.

*Range*.—From Magdalena Bay, Lower California (Orcutt), to Ecuador (Nobili); Galapagos Islands (Habel).

*Diagnosis*.—Carapace less than one and one-half times as wide as long, first three lateral teeth broad and shallow, last two small but well defined. Front with 4 well-marked, equal lobules. A strong tooth at base of dactyl of large chela.

*Material examined* (45 specimens from 19 stations).—

- 11-32. Conway Bay, Indefatigable Island, shore, Jan. 12, 1932, 1 male.  
 27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 2 males, 1 female.  
 30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 1 male, 3 females (1 ovig.).  
 42-33. Opposite Kicker Rock, Chatham Island, Jan. 31, 1933, 1 female.  
 49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 1 male.  
 52-33. Academy Bay, Indefatigable Island, shore, Feb. 4, 1933, 2 males, 1 female.  
 56-33. Flamingo Bay, Charles Island, shore, Feb. 5, 1933, 6 males, 2 females.

- 58-33. Cormorant Bay, Charles Island, shore, Feb. 6, 1933, 2 males, 2 females (1 ovig.).  
62-33. Black Bight, Albemarle Island, shore, Feb. 8, 1933, 3 females.  
76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 1 male.  
82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 3 males, 2 females.  
85-33. North Seymour Island, shore, Feb. 18, 1933, 1 male.  
93-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 2 males.  
96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 1 male.  
98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 2 specimens.  
202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 1 large female.  
306-35. Marchena Island, shore, Dec. 2, 1934, 2 males.  
314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 1 male.  
789-38. South Seymour Island, shore, Jan. 19, 1938, 1 large female.

*Measurements*.—Largest male: length 57 mm, width 86 mm, cheliped (rigid) coxa to elbow 45 mm, elbow to tip of dactyl 73 mm, chela 67 mm, dactyl 37 mm; large female: length 53.5 mm, width 82 mm, cheliped (rigid) coxa to elbow 38 mm, elbow to tip of dactyl 60 mm, chela 56 mm, dactyl 28 mm.

*Habitat*.—Shore, typically under large, columnar boulders of lava, which have to be pried apart with a crowbar.

*Depth*.—Shore.

*Remarks*.—Galapagos specimens of *O. verreauxii* attain large size. They are more secretive than other members of the genus, which accounts for their relative scarcity in collections.

### ***Ozius perlatus* Stimpson**

Plate 81, Fig. 2

*Ozius perlatus* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 211 (83), 1860. Rathbun, Bull. 152, U.S. Nat. Mus., p. 543, pl. 221, figs. 1 and 2, 1930. Boone, Zoologica, vol. 8, no. 4, p. 228, fig. 84, 1927. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 17, 1933. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Type locality*.—Cape San Lucas, Lower California.

*Types*.—Cotypes in MCZ, No. 1256.

*Range*.—From Cape San Lucas, Lower California (Xantus), to Santa Elena, Ecuador (Schmitt); Galapagos Islands, (*Arcturus*).

*Atlantic analogue*.—*O. reticulatus* (Desbonne and Schramm).

*Diagnosis*.—Carapace more than one and one-half times as wide as long. Anterolateral margins broadly arcuate. Chelipeds not strikingly dissimilar.

*Material examined* (170 specimens from 20 stations).—

- 10-32. James Bay, James Island, shore, Jan. 10, 1932, 16 males, 21 females (4 ovig.).
- 12-32. South Seymour Island, shore, Jan. 14-18, 1932, 1 male, 1 female.
- 42-33. Opposite Kicker Rock, Chatham Island, shore, Jan. 31, 1933, 2 males, 2 females, 1 young.
- 49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 1 female.
- 56-33. Flamingo Bay, Charles Island, shore, Feb. 5, 1933, 3 males, 3 females (2 ovig.), 3 young.
- 58-33. Cormorant Bay, Charles Island, shore, Feb. 6, 1933, 9 males, 12 females (6 ovig.), 5 young.
- 62-33. Black Bight, Albemarle Island, shore, Feb. 8, 1933, 11 males (1 photographed), 14 females (2 ovig.), 8 young.
- 65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 5 males, 8 females, (7 ovig.), 1 young.
- 69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 2 males.
- 82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 4 males.
- 85-33. North Seymour Island, shore, Feb. 18, 1933, 1 male, 1 female, 1 young.
- 93-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 1 female.
- 175-34. North Seymour Island, shore, Jan. 22, 1934, 1 male.
- 179-34. Bartholomew Island near James Island, shore, Jan. 23, 1934, 5 males, 5 females (3 ovig.).
- 306-35. Marchena Island, shore, Dec. 2, 1934, 1 male, 1 female, 1 young.
- 312-35. Black Beach, Charles Island, shore, Dec. 5, 1934, 1 male, 1 female.
- 314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 5 males, 2 females.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 2 young.
- 342-35. Bartholomew Island near James Island, shore, Dec. 12, 1934, 4 males, 2 females.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 1 male, 1 female.

*Measurements.*—Largest specimen, female: length 20.0 mm, width 33.2 mm, cheliped 31.0 mm, chela 20.0 mm, dactyl 10.0 mm.

*Color in life.*—Cardiac and intestinal regions pansy purple, blending into a dusky aricula purple on other areas. Grooves between areolations white, with only a little of the color of the adjoining areas. Chelipeds dark pansy purple to middle of fingers. Fingers banded with light taupe brown, lighter toward tips. Ambulatory legs light pansy purple, dactyl lighter, nail yellow. (Petersen)

*Habitat.*—In crevices between large boulders, where they may be found by removing loose pebbles.

*Depth.*—Shore.

*Remarks.*—This species is not nearly so abundant or so continuously distributed as the following *O. tenuidactylus* (Lockington). Small colonies adhere closely to a few favorable localities, as at James Bay, where about 40 were removed in a few minutes from a single moist pocket filled with smooth, round pebbles.

### ***Ozius tenuidactylus* (Lockington)**

Plate 81, Fig. 1

*Xantho tenuidactylos* Lockington, Proc. Calif. Acad. Sci., vol. 7, pt. 1, p. 98, 1877.

*Ozius tenuidactylos* Glassell, Trans. San Diego Soc. Nat. Hist., vol. 8, no. 14, p. 104, 1935.

*Ozius tenuidactylus* Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Ozius agassizii* A. Milne Edwards, Crust. Reg. Mex., p. 279, pl. 55, figs. 1-1d, 1880. Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 583, 1898; Bull. 152, U.S. Nat. Mus., p. 544, pl. 221, figs. 3 and 4, 1930. Boone, Zoologica, vol. 8, no. 4, p. 225, fig. 83, 1927. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 17, 1933.

*Type locality.*—Unknown; one of Lockington's.

*Type.*—Not extant.

*Range.*—From the Gulf of California (Lockington) to Ecuador (Nobili); Galapagos Islands (*Hassler Expedition*).

*Diagnosis.*—Carapace much more than one and one-half times wider than long. Anterolateral and posterolateral margins nearly straight, meeting in two rounded lobes at lateral angles. Chelipeds dissimilar, dactyls of minor chela extremely attenuated.

*Material examined* (1,224 specimens from 49 stations).—

11-32. Conway Bay, Indefatigable Island, shore, Jan. 12-14, 1932, 2 young.

- 12-32. South Seymour Island, shore, Jan. 17, 1932, 2 females.  
24-33. Gardner Bay, Hood Island, shore, Jan. 24, 1933, 3 males, 7 young.  
27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 2 males.  
28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 2 males.  
30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 1 male, 2 ovig. females, 3 young.  
33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 1 male.  
38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 1 male.  
42-33. Opposite Kicker Rock, Chatham Island, shore, Jan. 31, 1933, 4 males, 2 females.  
48-33. Barrington Island, shore, Feb. 2, 1933, 23 males, 16 females (1 ovig.), 5 young.  
49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 15 males, 15 females.  
52-33. Academy Bay, Indefatigable Island, shore, Feb. 4, 1933, 40 males, 34 females, 1 young.  
56-33. Flamingo Bay, Charles Island, shore, Feb. 5, 1933, 25 males, 26 females.  
58-33. Cormorant Bay, Charles Island, shore, Feb. 6, 1933, 6 males, 9 females.  
69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 1 male.  
71-33. James Bay, James Island, shore, Feb. 12, 1933, 20 males, 12 females (1 ovig.).  
76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 1 male, 2 females, 2 young.  
82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 85 males, 77 females (61 ovig.), 16 young.  
85-33. North Seymour Island, shore, Feb. 18, 1933, 56 males, 44 females (34 ovig.), 16 young.  
88-33. South Seymour Island, shore, Feb. 19, 1933, 20 males, 14 females (13 ovig.), 6 young.  
93-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 7 males, 3 females (2 ovig.), 1 young.  
96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 28 males, 27 females (21 ovig.), 1 young.  
97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 1 male.  
98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 1 male.



- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 5 males, 5 ovig. females.
- 146-34. Albemarle Point, Albemarle Island, shore, Jan. 12, 1934, 1 male.
- 153-34. Mangrove Point, Narborough Island, shore, Jan. 14, 1934, 1 male.
- 163-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 1 male, 2 females.
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 21 males, 20 females (10 ovig.).
- 174-34. South Seymour Island, shore, Jan. 22, 1934, 13 males, 25 females (6 ovig.).
- 175-34. North Seymour Island, shore, Jan. 22, 1934, 65 males, 70 females (15 ovig.).
- 179-34. Bartholomew Island near James Island, shore, Jan. 23, 1934, 20 males, 22 females.
- 188-34. Cartago Bay, Albemarle Island, shore, Jan. 25, 1934, 8 males, 6 females, 2 young.
- 199a-34. Post Office Bay, Charles Island, shore, Jan. 30, 1934, 4 males, 2 females.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 6 males, 5 females.
- 306-35. Marchena Island, shore, Dec. 2, 1934, 6 males, 6 females (1 ovig.), 2 young.
- 312-35. Black Beach, Charles Island, shore, Dec. 5, 1934, 26 males, 42 females.
- 314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 31 males, 43 females.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 8 males, 14 females.
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 5 males.
- 350-35. South Seymour Island, shore, Dec. 13, 1934, 1 male.
- 358-35. Gardner Bay, Hood Island, shore, Dec. 17, 1934, 11 males, 6 females, 1 young.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 1 male, 1 fragment.
- 782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 3 males, 4 females, 1 young.
- 784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 1 male.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 1 male.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 2 males.

800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 1 male, 5 females (2 ovig.).

808-38. Academy Bay, Indefatigable Island, shore, Jan. 25, 1938, 4 males, 6 females (4 ovig.).

*Measurements*.—Largest specimen, female: length 16.5 mm, width 25.9 mm, cheliped 34.0 mm, chela 23.3 mm, dactyl 10.8 mm.

*Color in life*.—Carapace and chelipeds uniform heliotrope purple. Fingers black, lightening toward tips. Eggs magenta. (Garth)

*Habitat*.—Shore, under loose rocks and pebbles. Rarely found in coral.

*Depth*.—Shore.

*Remarks*.—This species is one of the most abundant of the Galapagos fauna and is exceeded in numbers of specimens collected only by *Leptodius cooksoni* Miers among free-living Xanthidae. It may be distinguished at once from its congeners and from all other Galapagos xanthids by the extremely tenuous dactyls of the minor chela, which suggested to Lockington the specific name *tenuidactylus*. The species has gone for many years under the name of *Ozius agassizii* A. Milne Edwards, and so appears in all publications dealing with Galapagos Brachyura with the exception of Schmitt (1939), and including the Rathbun monograph (1930).

### Genus **ERIPHIA** Latreille, 1817

#### KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Eriphia*

- A<sup>1</sup> Frontal lobes and margins of orbit smooth and convex. Tubercles of wrist coalesced . . . . . *E. granulosa*  
 A<sup>2</sup> Frontal lobes and margins of orbit thin and granulate. Tubercles of wrist single . . . . . *E. squamata*

### **Eriphia squamata** Stimpson

Plate 83, Figs. 5, 6

*Eriphia squamata* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 56 (10), 1859. Rathbun, Zoologica, vol. 5, no. 14, p. 158, 1924; Bull. 152, U.S. Nat. Mus., p. 550, pl. 223; pl. 224, fig. 1; text fig. 84, and synonymy, 1930. Hult, Arkiv för Zoologi, Band 30A, no. 5, p. 13, 1938.

*Type locality*.—Mazatlan, Mexico.

*Type*.—Not extant.

*Range*.—From Magdalena Bay, Lower California (Orcutt), and Agua Verde Bay, Gulf of California (*Albatross*), to Salinas, Ecuador (Schmitt); Galapagos Islands (Jones).

*Atlantic analogue.*—*E. gonagra* (Fabricius).

*Diagnosis.*—Front wide, lobes truncate, edges thin and granulate. Granules of gastric region arranged in short rows. Tubercles of wrist single, rounded, and ciliated anteriorly.

*Material examined.*—None from among Hancock Galapagos material. The W. H. Jones specimen, USNM No. 17783, male, has been examined and is definitely of this species. It was taken at Chatham Island, Galapagos, April 16-17, 1884, and is photographically reproduced herein. Two females from Eden Island, Galapagos, taken by the *Noma* Expedition in 1923 have also been examined through the courtesy of Miss Jocelyn Crane of the New York Zoological Society. A series of this species taken at Cocos Island by the Hancock Expeditions has been used in comparing the Galapagos material.

### *Eriphia granulosa* A. Milne Edwards

Plate 80, Fig. 2

*Eriphia granulosa* A. Milne Edwards, Crust. Reg. Mex., p. 339, pl. 56, figs. 2-2b, 1880. Rathbun, Proc. Washington Acad. Sci., vol. 4, no. 8, p. 282, 1902; Bull. 152, U.S. Nat. Mus., p. 551, pl. 224, figs. 2-4, 1930. Boone, Zoologica, vol. 8, no. 4, p. 234, 1927 (part: the Galapagos specimens). Finnegan, Journ. Linn. Soc. London, vol. 37, p. 646, 1931. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 18, 1933. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Type locality.*—Chile (?).

*Type.*—In Paris Mus.

*Range.*—Chile (?) (the holotype); Galapagos Islands (Jones); *not* Cocos Island (Boone).

*Diagnosis.*—Anterolateral margins spinate. Frontal lobes and margins of orbit smooth and convex, edges of front arching. Granules of gastric region single, not combined in rows. Tubercles of wrist coalesced.

*Material examined* (553 specimens from 58 stations).—

27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 3 males, 3 females (2 ovig.).

28-33. Gardner Bay, Hood Island, 2 fms, Jan. 25, 1933, 1 male, 1 young.

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 9 males, 2 females, 1 fragment.

33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 3 males, 3 ovig. females.

38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 2 males.

- 48-33. Barrington Island, shore, Feb. 2, 1933, 3 males, 2 females (1 ovig.).
- 49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 2 males.
- 52-33. Academy Bay, Indefatigable Island, shore, Feb. 4, 1933, 4 females (1 ovig.).
- 56-33. Flamingo Bay, Charles Island, shore, Feb. 5, 1933, 2 males, (1 photographed), 3 ovig. females.
- 58-33. Cormorant Bay, Charles Island, shore, Feb. 6, 1933, 2 males, 1 female.
- 65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 5 males, 3 females, 1 young.
- 69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 25 males, 13 females, 6 young.
- 71-33. James Bay, James Island, shore, Feb. 12, 1933, 4 males, 5 females.
- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 4 males, 1 female.
- 76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 3 males, 1 female.
- 80-33. Duncan Island, shore, Feb. 15, 1933, 1 young.
- 82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 1 female, 1 young.
- 85-33. North Seymour Island, shore, Feb. 18, 1933, 7 males, 3 females.
- 88-33. South Seymour Island, shore, Feb. 19, 1933, 1 male, 2 females.
- 93-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 1 male.
- 96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 9 males, 16 females (7 ovig.).
- 98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 4 males, 5 ovig. females.
- 101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 6 males, 13 females (8 ovig.).
- 146-34. Albemarle Point, Albemarle Island, shore, Jan. 12, 1934, 12 males, 6 females (3 ovig.).
- 152-34. Tagus Cove, Albemarle Island, coral, Jan. 14, 1934, 1 male, 1 female, 7 young.
- 154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 4 males, 4 ovig. females.
- 161-34. Black Beach, Charles Island, 3 fms, Jan. 17, 1934, 2 males.
- 163-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 2 males, 8 females (7 ovig.).

- 166-34. Black Beach, Charles Island, shore, Jan. 19, 1934, 2 males, 4 females (3 ovig.).
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 9 males, 11 females (10 ovig.).
- 174-34. South Seymour Island, shore, Jan. 22, 1934, 2 males, 2 ovig. females.
- 175-34. North Seymour Island, shore, Jan. 22, 1934, 10 males, 6 females (5 ovig.).
- 179-34. Bartholomew Island near James Island, shore, Jan. 23, 1934, 2 males, 3 ovig. females.
- 188-34. Cartago Bay, Albemarle Island, shore, Jan. 25, 1934, 1 male, 1 ovig. female.
- 194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 1 male, 1 small female.
- 199-34. Black Beach, Charles Island, shore, Jan. 30, 1934, 1 male.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 6 males, 5 females.
- 306-35. Marchena Island, shore, Dec. 2, 1934, 12 males, 3 females (1 ovig.), 1 fragment.
- 312-35. Black Beach, Charles Island, shore, Dec. 5, 1934, 11 males, 11 females (7 ovig.).
- 313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 1 male.
- 314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 20 males, 22 females (13 ovig.).
- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 16 males, 1 fragment.
- 316-35. Off Gordon Rocks, Indefatigable Island, 20 fms, Dec. 8, 1934, 1 male.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 15 males, 9 females (5 ovig.).
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 27 males, 17 females (10 ovig.).
- 350-35. South Seymour Island, shore, Dec. 13, 1934, 3 males, 4 females (3 ovig.).
- 354-35. Wreck Bay, Chatham Island, shore, Dec. 15, 1934, 1 male, 1 female.
- 357-35. Gardner Bay, Hood Island, coral, Dec. 17, 1934, 14 males, 6 females (2 ovig.).
- 358-35. Gardner Bay, Hood Island, shore, Dec. 17, 1934, 2 males, 1 female.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 23 males, 6 females.

- 782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 5 males, 5 females.  
784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 2 males.  
789-38. South Seymour Island, shore, Jan. 19, 1938, 3 females.  
796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 3 males, 1 female.  
800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 1 male.  
804-38. Onslow Island, near Charles Island, coral, Jan. 23, 1938, 1 female.  
808-38. Academy Bay, Indefatigable Island, shore, Jan. 25, 1938, 2 males.  
811a-38. Barrington Island, *Pavona* coral, Jan. 26, 1938, 1 young female.

*Measurements*.—A large male: length 14.0 mm, width 19.0 mm, cheliped (rigid) coxa to elbow 12 mm, elbow to tip of dactyl 16 mm, chela 15.0 mm, dactyl 8.0 mm.

*Color in life*.—Carapace and chelipeds purplish brown. Apple-green markings on cardiac region. Two longitudinal bands of purple on maxillipeds and three on subhepatic region. Last three rows of squamae on chelae (most ventral) white. Abdominal segments each marked with purplish brown transversely. Row of setae on hepatic region yellow. (Garth)

*Habitat*.—Shore, under rocks, and in *Pocillopora* coral.

*Depth*.—Shore to 3 fms.

*Remarks*.—After a careful individual examination of over 500 specimens of *Eriphia* from the Galapagos Islands in Hancock collections it appears that all are *E. granulosa*. The writer differs emphatically from Boone (1927, p. 234), who avers that this species may prove to be only a subspecies of *E. squamata* Stimpson and agrees with Rathbun (1930, p. 552) that it is very distinct from, and not to be confused with, the *gonagra-squamata* type. Her distinguishing features are borne out very nicely by a pair of Hancock specimens from Charles Island which were compared with Hopkins-Stanford material (USNM No. 25667). The front is entire, the granules of the carapace single, and the tubercles of the wrist tend to form bands (pl. 80, fig. 2).

That there has been confusion of these species, even among specialists, is amply demonstrated. A specimen in the National Museum identified by Rathbun as *squamata*, Pinchot Expedition, Daphne Island, A. K. Fisher, collector, is definitely *granulosa*. The specimens reported by Boone (1927) from Cocos Island as *granulosa* have been re-examined at the request of the writer by Miss Jocelyn Crane of the New York Zoological Society and have proved to be *squamata*.

The occurrence of *E. granulosa* at localities other than the Galapagos Islands is open to question. A footnote in Rathbun (1930, p. 552) states that an interrogation point follows the designation "Chili" on the label of the type specimen in the Paris Museum. Its reported occurrence on Cocos Island has been disposed of in the paragraph above. In conclusion, it would seem that *E. granulosa* is a Galapagos endemic species, and that *E. squamata*, found from Mexico to Ecuador occurs also at Cocos and sporadically in the Galapagos Islands (pl. 83, figs. 5, 6).

Genus **ERIPHIDES** Rathbun, 1897

**Eriphides hispida** (Stimpson)

Plate 83, Figs. 3, 4

*Eriphia hispida* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 218 (90), 1860.

*Eriphides hispida* Rathbun, Proc. Washington Acad. Sci., vol. 4, p. 282, 1902; Bull. 152, U.S. Nat. Mus., p. 552, pls. 225 and 226, 1930. Boone, Zoologica, vol. 8, no. 4, p. 236, fig. 87A, 1927; (not fig. 87b, which is *Pilumnus xantusii* Stimpson). Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 18, 1933. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Pseuderiphia hispida* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 590, 1898.

*Type locality.* West coast of Central America.

*Type.*—Not extant.

*Range.*—West coast of Costa Rica (Tristan) to Panama (A. Milne Edwards); Galapagos Islands (*Albatross*).

*Diagnosis.*—Carapace and chelipeds covered with short bristles and paved with sharp granules. Front very wide. Fingers of minor chela spoon shaped.

*Material examined* (133 specimens from 31 stations).—

10-32. James Bay, James Island, shore, Jan. 10, 1932, 1 male.

12-32. South Seymour Island, shore, Jan. 17, 1932, 1 male.

24-33. Gardner Bay, Hood Island, shore, Jan. 24, 1933, 1 specimen.

38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 13 males, 16 ovig. females (1 photographed).

52-33. Academy Bay, Indefatigable Island, shore, Feb. 4, 1933, 4 specimens.

56-33. Flamingo Bay, Charles Island, shore, Feb. 5, 1933, 5 males, 6 females (2 ovig.), 1 young.

65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 8 males, 4 young.

- 68-33. South of Cape Berkeley, Albemarle Island, shore, Feb. 10, 1933, 1 male.
- 69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 1 male.
- 71-33. James Bay, James Island, shore, Feb. 12, 1933, 3 specimens.
- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 5 specimens.
- 82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 1 specimen.
- 85-33. North Seymour Island, shore, Feb. 18, 1933, 2 males, 2 ovig. females, 2 young.
- 88-33. South Seymour Island, shore, Feb. 19, 1933, 1 young.
- 93-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 1 male, 1 ovig. female, 2 young.
- 96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 2 males.
- 146-34. Albemarle Point, Albemarle Island, shore, Jan. 12, 1934, 3 males.
- 163-34. Black Beach, Charles Island, shore, Jan. 18, 1934, 1 male, 2 ovig. females.
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 1 male, 2 females.
- 175-34. North Seymour Island, shore, Jan. 22, 1934, 6 males, 3 females.
- 179-34. Bartholomew Island near James Island, Jan. 23, 1934, 4 males, 1 female.
- 199a-34. Post Office Bay, Charles Island, shore, Jan. 30, 1934, 1 male.
- 306-35. Marchena Island, shore, Dec. 2, 1934, 9 males, 1 female, 1 young.
- 312-35. Black Beach, Charles Island, shore, Dec. 5, 1934, 8 males, 1 female.
- 314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 1 female.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 3 males, 4 females, 1 young.
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 1 male.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 11 specimens.
- 782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 1 female, 2 young.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 1 male.
- 808-38. Academy Bay, Indefatigable Island, shore, Jan. 25, 1938, 1 female.



*Measurements*.—Large female: length 43.7 mm, width 59 mm, cheliped 67 mm, chela 38 mm, dactyl 21 mm.

*Color in life*.—Carapace dull violet black with a few cadmium orange patches showing on gastric and cardiac areas. Eyes garnet brown. Cheliped neutral red with tubercles violet black. Movable finger neutral red with purplish tint fading toward tip. Fixed finger very much darker, almost black, with white tip and teeth. Ventral side dull orange yellow with abdomen dull purplish red. Eggs scarlet. (Petersen)

*Habitat*.—Rocky shore; typically in burrows in sandstone.

*Depth*.—Shore.

*Remarks*.—The purple bristle crab is one of the most formidable members of the Galapagos crustacean fauna, and one of the very few species capable of inflicting a painful wound. The massive claws maintain their viselike grip even after being severed from the body. A ledge of soft rock southeast of Cormorant Point, Charles Island, was riddled with burrows of this species.

Genus **DOMECIA** Eydoux and Souleyet, 1842

***Domecia hispida*** Eydoux and Souleyet

Plate 81, Fig. 5

*Domecia hispida* Eydoux and Souleyet, Voy. Bonite, vol. 1, Crust., p. 235, 1842. Rathbun, Bull. 152, U.S. Nat. Mus., p. 554, pl. 227, and synonymy, 1930. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 647, 1931. Crane, Zoologica, vol. 22, no. 3, p. 73, 1937.

*Type locality*.—Sandwich Islands.

*Type*.—In Paris Mus.

*Range*.—From Arena Bank, Gulf of California (*Zaca*), to Gorgona Island, Colombia (Crossland); Eastern Atlantic, Indian, and Pacific Oceans.

*Diagnosis*.—Carapace transversely oval, flat, smooth. Front and anterolateral margins profusely spinulose, posterolateral margins converging rapidly. Chelipeds covered with black spines. Merus of third maxilliped of no great length. Legs spiny.

*Material examined* (250 specimens from 20 stations).—

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 2 females (1 ovig.).

47-33. Barrington Island, 2 fms, Feb. 2, 1933, 1 ovig. female.

59-33. Off Cormorant Bay, Charles Island, 13 fms, Feb. 6, 1933, 1 male.

69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 20 males, 26 females (12 ovig.).

- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 3 males, 18 females (12 ovig.), 1 young.
- 76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 9 males, 11 females (7 ovig.).
- 80-33. Duncan Island, coral, Feb. 15, 1933, 14 males, 18 females (9 ovig.), 5 young.
- 82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 1 male, 2 females.
- 94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 33 specimens.
- 97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 18 males, 24 females (16 ovig.).
- 101a-33. Darwin Bay, Tower Island, coral, Feb. 26, 1933, 5 males, 2 ovig. females.
- 168a-34. Academy Bay, Indefatigable Island, coral, Jan. 20, 1934, 1 female.
- 189-34. Cartago Bay, Albemarle Island, coral, Jan. 25, 1934, 2 females (1 ovig.).
- 194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 1 male, 1 female.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 1 female.
- 309-35. Marchena Island, 8 fms, Dec. 3, 1934, 1 specimen.
- 311-35. Marchena Island, 20 fms, Dec. 3, 1934, 1 specimen.
- 315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 5 males, 3 females (2 ovig.).
- 804-38. Onslow Island near Charles Island, coral, Jan. 23, 1938, 2 males, 1 female.
- 811-38. Barrington Island, coral, Jan. 26, 1938, 5 males (1 photographed), 12 females (6 ovig.).

*Measurements*.—A large female: length 8.3 mm, width 10.8 mm.

*Habitat*.—*Pocillopora* coral, shallow dredging. Among sponges, under stones. (Crane)

*Depth*.—Shore; also 8-20 fms.

*Remarks*.—Associated with the *Trapezias* in the *Pocillopora* colony, this species was taken occasionally where coral was not recorded. It was probable in such a case that a small head of coral was found and cracked on the beach, no record having been made of it at the time. This species was dredged twice in shallow water.

*D. hispidus* is now recorded from the Galapagos Islands.

Genus **TRAPEZIA** Latreille, 1825KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Trapezia*

- A<sup>1</sup> Fronto-orbital width greatest width of carapace. No lateral tooth . . . . . *T. digitalis*  
 A<sup>2</sup> Fronto-orbital width less than greatest width of carapace. A lateral tooth . . . . . *T. cymodoce ferruginea*

***Trapezia cymodoce ferruginea* Latreille**

Plate 81, Fig. 4

*Trapezia ferruginea* Latreille, Encyc. Meth., Hist. Nat., Entom., vol. 10, p. 695, 1825.

*Trapezia cymodoce ferruginea* Rathbun, Mem. Mus. Comp. Zool., vol. 35, p. 58, 1907; Bull. 152, U.S. Nat. Mus., p. 557, pl. 228, figs. 1 and 2, and synonymy, 1930. Boone, Zoologica, vol. 8, no. 4, p. 240, fig. 88, 1927. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 645, 1931. Hult, Arkiv för Zoologi, Band 30A, no. 5, p. 13, 1938. Crane, Zoologica, vol. 22, no. 3, p. 73, 1937.

*Type locality*.—Red Sea.

*Type*.—Not in Paris Mus.

*Range*.—From Arena Bank, Gulf of California (*Zaca*), to Gorgona Island, Colombia (Crossland); Galapagos Islands (*Arcturus*); Red Sea and Indo-Pacific Ocean.

*Diagnosis*.—Carapace smooth, no trace of regions. Fronto-orbital width almost equal to width of carapace. Anterolateral margins short, diverging slightly posteriorly. A lateral tooth projecting. Color red.

*Material examined* (1,809 specimens from 21 stations).—

30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 37 males, 31 females (16 ovig.).

69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 411 specimens.

73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 37 males, 26 females (18 ovig.).

76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 17 males, 17 females (12 ovig.).

80-33. Duncan Island, coral, Feb. 15, 1933, 42 males, 37 females (27 ovig.), 2 young.

94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 308 specimens.

96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 1 male.

97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 486 specimens.

- 99-33. Darwin Bay, Tower Island, tangles, Feb. 25, 1933, 1 male, 1 ovig. female, 2 young.
- 101a-33. Darwin Bay, Tower Island, coral, Feb. 26, 1933, 23 males, 13 females (8 ovig.).
- 168a-33. Academy Bay, Indefatigable Island, coral, Jan. 20, 1934, 5 males, 3 females.
- 189-34. Cartago Bay, Albemarle Island, coral, Jan. 25, 1934, 6 males, 5 females (4 ovig.).
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, 3 males, 1 female.
- 315-35. Opposite Gordon Rocks, Indefatigable Island, 8-10 fms, Dec. 8, 1934, 32 males, 26 females (20 ovig.), 2 young.
- 320-35. Academy Bay, Indefatigable Island, 8-10 fms, Dec. 8, 1934, 2 males.
- 350-35. South Seymour Island, shore, Dec. 13, 1934, 1 male, 1 ovig. female.
- 782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 3 males, 2 females (1 ovig.), 1 young.
- 784-38. Darwin Bay, Tower Island, coral, Jan. 17, 1938, 6 males, 5 females (2 ovig.).
- 789-38. South Seymour Island, shore, Jan. 19, 1938, 1 male, 4 females (2 ovig.).
- 800-38. Cartago Bay, Albemarle Island, shore, Jan. 22, 1938, 3 specimens.
- 811-38. Barrington Island, coral, Jan. 26, 1938, 206 specimens.
- Measurements.*—A large, ovigerous female: length 13.3 mm, width 16.3 mm, cheliped 26.3 mm, chela 16.5 mm, dactyl 8.2 mm.

*Color in life.*—Bright red.

*Habitat.*—The *Pocillopora* coral colony.

*Depth.*—Shore to 10 fms.

*Remarks.*—The collection of over 1,800 of this red porcelain crab was almost involuntary. Every head of living *Pocillopora* coral contained hundreds of specimens, and it was as convenient to preserve them as to toss them overboard while cracking coral. In view of the exceeding abundance of this species, it seems incredible that a single specimen obtained by William Beebe and two specimens by Rolf Blomberg are the only examples ever recorded from the Galapagos Islands. Apparently, no other expedition has examined coral heads, for the *Trapezias* rarely stray beyond the protecting labyrinth of their rasping branches.

**Trapezia digitalis** Latreille

Plate 81, Fig. 6

*Trapezia digitalis* Latreille, Encyc. Meth., Hist. Nat., Entom., vol. 10, p. 696, 1825. Rathbun, Bull. 152, U.S. Nat. Mus., p. 559, pl. 228, figs. 5 and 6, and synonymy, 1930. Crane, Zoologica, vol. 22, no. 3, p. 73, 1937.

*Type locality*.—Red Sea.

*Type*.—Not extant.

*Range*.—From Arena Bank, Gulf of California (*Zaca*), to Panama (Bradley); Red Sea to Indo-Pacific Ocean.

*Diagnosis*.—Carapace smooth, regions not indicated. Fronto-orbital width greatest width of carapace, the anterolateral margins converging posteriorly. No lateral projection. Color brown.

*Material examined* (667 specimens from 18 stations).—

30-33. Gardner Bay, Hood Island, coral, Jan. 26, 1933, 5 males, 6 females.

69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 82 males, 59 females (40 ovig.), 5 young.

73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 9 males, 10 females (2 ovig.).

76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 4 males, 8 females (7 ovig.).

80-33. Duncan Island, coral, Feb. 15, 1933, 11 males, 12 females (8 ovig.).

94-33. Darwin Bay, Tower Island, coral, Feb. 22, 1933, 61 males, 70 females (36 ovig.), 11 young.

97-33. Darwin Bay, Tower Island, coral, Feb. 24, 1933, 41 males, 31 females (15 ovig.).

99-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 2 males, 1 female.

101a-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 15 males, 8 females (4 ovig.).

-33. Galapagos Islands, 1933, 52 males, 47 females (15 ovig.), 7 young.

168a-34. Academy Bay, Indefatigable Island, coral, Jan. 20, 1934, 1 male, 1 ovig. female.

202-34. Gardner Bay, Hood Island, coral, Jan. 31, 1934, 1 female.

315-35. Opposite Gordon Rocks, Indefatigable Island, coral, Dec. 8, 1934, 16 males, 7 females (3 ovig.), fragment.

782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 1 male.

784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 4 males, 5 females (2 ovig.).

789-38. South Seymour Island, shore, Jan. 19, 1938, 4 males, 1 ovig. female.

800-38. Cartago Bay, Albemarle Island, Jan. 22, 1938, 1 male.

811-38. Barrington Island, coral, Jan. 26, 1938, 28 males, 30 females (21 ovig.).

*Measurements*.—A large female: length 10.8 mm, width 13.5 mm, cheliped 18.0 mm, chela 12.8 mm, dactyl 7.3 mm.

*Color in life*.—Brown and yellow.

*Habitat*.—The *Pocillopora* coral colony.

*Depth*.—Shore.

*Remarks*.—This brown and yellow *Trapezia* occurs with the red *T. cymodoce ferruginea* Latreille in the proportion of 1:3. In separating so many hundreds, the color alone was relied upon, although there are other important differences, as given in the diagnoses. The front of *T. digitalis* is finely denticulate, as compared to the shallow frontal lobes of *T. c. ferruginea*, and there is no lateral tooth.

*T. digitalis* is now recorded from the Galapagos Islands.

### Genus **QUADRELLA** Dana, 1851

#### **Quadrella nitida** Smith

Plate 80, Fig. 6

*Quadrella nitida* Smith, Proc. Boston Soc. Nat. Hist., vol. 12, p. 288, 1869. Rathbun, Bull. 152, U.S. Nat. Mus., p. 561, pl. 229, and synonymy, 1930. Crane, Zoologica, vol. 22, no. 3, p. 74, 1937.

*Type locality*.—Pacheca, Perlas Islands, Panama.

*Type*.—In Peabody Mus., Yale Univ.

*Range*.—Lower California (Stimpson) to Panama (Bradley); 6-75 fms. (Crane)

*Diagnosis*.—Carapace hexagonal, convex, smooth, regions not indicated. Front cut into 4 spines, median notch deepest. Merus of cheliped stout, projecting beyond carapace and armed with 6 to 8 spines. Carpus with an inner tooth. Hand exceeding width of carapace, fingers long and incurved.

*Material examined*.—

311-35. Marchena Island, 20 fms, Dec. 3, 1934, 1 young (photographed).

*Measurements*.—Young specimen: length 3.4 mm, width 3.5 mm.

*Color in life*.—From a Gulf of California specimen: ground color of carapace light yellowish drab gray, overcast with tiny snowflakelike blotches. Front dark scarlet red, extended on eyestalk. Ground color of cheliped deep orange buff. Merus netted with light scarlet; carpus same but much lighter scarlet; hand overcast with scarlet spots, very dense on upper surface and extending on fingers. A few large, carmine spots at the distal end of the hand and on the fingers. Ambulatory legs a warm buff. (Petersen)

*Habitat*.—The gorgonian, *Muricea miser* Verrill, according to Crane.

*Depth*.—6-75 fms. (Crane)

*Remarks*.—For a classic description of the remarkable association of this rare xanthid crab and the gorgonian, *Muricea miser* Verrill, the reader is referred to Crane (1937).

*Q. nitida* is now recorded from the Galapagos Islands.

### Genus **MALDIVIA** Borradaile, 1903

*Maldivia* Borradaile, In: J. S. Gardiner, Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, pt. 1, pp. 269-270, 1903.

The following are the characters of this genus: (1) *Carapace* hexagonal, swollen, a little longer than broad, hairless, roughened with granulations which pass into spines at the sides, and with indications of the regions. (2) *Front* broad, triangular, widely grooved, bent strongly downwards. (3) *Anterolateral edge* toothed, about equal to postero-lateral. *Hind edge* wavy. (4) *Orbits* large, very slanting, not fully closed. (5) Abdomen of male seven-jointed. (6) *Endostome ridges* present, but not very strong. (7) *Eyes* large. (8) *Antennae* with slender basal joints which do not touch the front, and long flagella. (9) *Merus of third maxilliped* about as long as broad, without a notch in the fore edge, which is straight. (10) Chelipeds stout, *Pilumnus*-like, fingers not hollowed at the tip. (11) Walking legs moderately stout. (Borradaile)

### **Maldivia galapagensis** Garth

Plate 80, Fig. 5

*Maldivia galapagensis* Garth, Allan Hancock Pac. Exped., vol. 5, no. 2, p. 22, pl. 8, figs. 1-6.

*Type locality*.—Onslow Island near Charles Island, Galapagos Islands, from *Pavona* coral in 2 fms.

*Type*.—AHF no. 385.

*Range*.—Charles and Barrington Islands, Galapagos Islands.

*Diagnosis*.—Carapace convex, polished, faintly granulate anteriorly. Posterolateral borders exceeding anterolateral; 2 denticles on anterolateral margin. Granules of cheliped flattened, not arranged in rows. Minor chela excavate, fingers slender, curved, with knifelike edges.

*Material examined* (31 specimens from 4 stations).—

180-34. Sullivan Bay, James Island,  $3\frac{1}{2}$  fms, coral, Jan. 22, 1934, 1 male, 4 females (3 ovig.).

194-34. Post Office Bay, Charles Island, coral from Onslow Island crater, Jan. 27, 1934, 7 males, 11 females.

804-38. Onslow Island near Charles Island, *Pavona* coral, Jan. 23, 1938, 2 males, 4 females, (the type series, including the male holotype, AHF no. 385).

811a-38. Barrington Island, *Pavona* coral, Jan. 26, 1938, 2 females.

*Measurements*.—Male holotype: length 3.7 mm, width 4.6 mm, chela 4.9 mm; female allotype: length 3.9 mm, width 5.5 mm.

*Color in life*.—Ground color of carapace ivory yellow to cream buff with designs of Eugenia red and grass green on posterior and Brazil red and cedar green on anterior areas. Cheliped clear creamy white with coral red on merus and carpus. Fingers hazel brown at base, becoming lighter toward tips. Ventral side clear white with tinge of bluish lavender. (Petersen)

*Habitat*.—*Pavona* coral.

*Depth*.— $2-3\frac{1}{2}$  fms.

*Remarks*.—The compact heads of "brain coral" (*Pavona* sp.) allow much less freedom of movement for the crustaceans which inhabit their interstices than do the multiramose heads of *Pocillopora*. The *Pavona* colony is therefore made up of fewer and less active species than the *Trapezias* and *Domecias*, the alpheid and penaeid shrimps of the *Pocillopora*, which indeed were totally lacking in the three loads of *Pavona* cracked by *Velero III* parties. In their place are the delicate *Maldivia* and an even more fragile shrimp, which has been turned over to Dr. W. L. Schmitt for study. Although an effort was made to find specimens *in situ*, none were observed as the cracking with geological hammers proceeded. All specimens were recovered from the rinse water at the bottom of the bucket.



Family **PINNOTHERIDAE**Subfamily **PINNOTHERINAE**Genus **PARAPINNIXA** Holmes, 1894**Parapinnixa glasselli** Garth

Plate 84, Figs. 1, 2

*Parapinnixa glasselli* Garth, Allan Hancock Pac. Exped., vol. 5, no. 2, p. 24, pl. 9, figs. 1-4, 1939.

*Type locality*.—Tagus Cove, Albemarle Island, Galapagos Islands.

*Type*.—USNM No. 77367.

*Range*.—Known only from the type locality.

*Diagnosis*.—Displacement of first ambulatory leg equal to nearly one-half the volume of carapace. Fingers long and slender, gaping when closed, a small tooth near tips. Immovable finger curving well downward. Lines separating abdominal segments sinuous.

*Material examined*.—

66a-33. Tagus Cove, Albemarle Island, from "roach" trap attached to fish trap suspended in 2 fms, Feb. 9, 1933, 2 females, including the holotype (USNM No. 77367).

*Measurements*.—Female holotype: length 2.8 mm, width 6.5 mm.

*Habitat*.—Worm tubes.

*Depth*.—2-3 fms.

*Remarks*.—The capture of two female specimens in a baited "roach" trap, suspended in two fathoms of water attached to a lobster pot, suggests that this species, while undoubtedly commensal, does not hesitate to fare forth from its worm tube in search of food.

The male of the species is unknown.

Subfamily **PINNOTHERELIINAE**Genus **PINNIXA** White, 1846**Pinnixa transversalis** (Milne Edwards and Lucas)

Plate 84, Figs. 6-8

*Pinnotheres transversalis* Milne Edwards and Lucas, d'Orbigny's Voy. Amer. Merid., vol. 6, pt. 1, p. 23, 1843; vol. 9, atlas, pl. 10, figs. 3-3e, 1847.

*Pinnixa transversalis* Milne Edwards, Ann. Sci. Nat., ser. 3, Zool., vol. 20, p. 220 (186), pl. 11, fig. 5, 1853. Rathbun, Bull. 97, U.S. Nat. Mus., p. 131, pl. 29, figs. 1-3, text figs. 74-76, and synonymy, 1918. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 648, 1931.

*Type locality*.—Chile.

*Type*.—In Paris Mus.

*Range*.—From Coiba Island, Panama (Crossland), to Punta Arenas, Patagonia (Lenz).

*Atlantic analogue*.—*P. faxoni* Rathbun.

*Diagnosis*.—A prominent ridge across carapace at cardiac level. Lateral angles forming a prominent shoulder. Terminal segment of palpus of third maxilliped reaching proximal end of merus. Abdomen of male enlarging from middle of sixth segment; tip semicircular.

*Material examined*.—

783-38. Darwin Bay, Tower Island, 40-70 fms, Jan. 16, 1938, 1 male, 2 females.

*Measurements*.—Largest specimen, female: length 5.0 mm, width 9.4 mm.

*Habitat*.—From the tubes of *Chaetopterus variopedatus* (Renier), identified by Olga Hartman. (See pl. 84, fig. 7).

*Depth*.—2½-70 fms.

*Remarks*.—The occurrence of this commensal crab may be expected wherever its widespread host, *Chaetopterus*, is found. This worm builds a tube to which sand particles are attached by agglutination.

*P. transversalis* is now recorded from the Galapagos Islands.

Genus **PINNAXODES** Heller, 1865  
**Pinnaxodes chilensis** (Milne Edwards)

Plate 84, Figs. 3-5

*Pinnotheres chilensis* Milne Edwards, Hist. Nat. Crust., vol. 2, p. 33, 1837.

*Pinnaxodes chilensis* Smith, in Verrill, Amer. Nat., vol. 3, p. 245, 1869. Rathbun, Bull. 97, U.S. Nat. Mus., p. 175, pl. 38, text fig. 111a and b, and synonymy, 1918. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 26, 1939.

*Type locality*.—Valparaiso, Chile.

*Type*.—In Paris Mus.

*Range*.—Ecuador (Heller) to Port Otway, Patagonia (*Albatross*); Galapagos Islands (Hopkins-Stanford Expedition).

*Diagnosis*.—Carapace subquadrate with rounded corners, soft in female, firm in male. Female chelae elongate. A constriction about sixth abdominal segment of male.

*Material examined*.—

154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, a single specimen contained within the test of the sea urchin, *Strongylocentrotus gibbosus* (Valenciennes) (pl. 84, fig. 4).

*Habitat*.—Commensal in the periproct of the sea urchin, *S. gibbosus*.

*Remarks*.—Schmitt (1939) is in error in stating that the first time this species had been observed in the Galapagos Islands was on the Presidential Cruise of 1938. Actually, it was taken on the Hopkins-Stanford Expedition in 1898-99, but because of its commensal habit was observed, not by the person who reported on the Brachyura, but by the person who wrote up the echinoderms. H. L. Clark (1902) writes concerning *Strongylocentrotus gibbosus* (Valenciennes):

"There are 11 dry specimens of this interesting urchin, from Tagus Cove. They range in diameter from 16 to 40 mm. The color is a distinct reddish-brown, the spines very dark olive, tipped with purplish; specimens from Chile and Peru, whence this species was previously known, are said to be gray. *All but the smallest of the shells before me are distorted by the presence of the parasitic crab so generally found in this urchin, and in all but 3 the crab is present.*" (Italics are author's)

Because the relationship between *Pinnaxodes chilensis* and this host is a specific one, there can be no doubt that this was the species observed by Dr. Clark.

### Family CYMOPOLIIDAE

#### Genus CYMOPOLIA Roux, 1828

##### KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Cympolia*

- A<sup>1</sup> Second ambulatory leg not more than twice as long as carapace
  - B<sup>1</sup> Two acuminate anterolateral spines, excluding exorbital
    - C<sup>1</sup> Four slender frontal teeth. Carapace  $1\frac{1}{8}$  times broader than long . . . . . *C. lucasii*
    - C<sup>2</sup> Two large, triangular frontal teeth. Carapace  $1\frac{1}{4}$  times as broad as long . . . . . *C. cortezi*
  - B<sup>2</sup> Four truncate anterolateral spines, excluding exorbital. A sternal plate at base of third walking leg . . . *C. velerae*
- A<sup>2</sup> Second ambulatory leg more than twice as long as carapace . . . . . *C. fragilis*

#### *Cympolia cortezi* Crane

Plate 85, Fig. 2

*Cympolia cortezi* Crane, Zoologica, vol. 22, no. 3, p. 75, pl. 8, fig. 25, 1937.

*Type locality*.—Santa Inez Bay, Gulf of California; 60 fms.

*Type*.—N.Y. Zool. Soc. No. 36,895.

*Range*.—Known only from the type locality.

*Diagnosis*.—Front with 2 large, triangular teeth; 2 sharp antero-lateral teeth. Last leg overreaching merus of third ambulatory leg. Lobe at distal extremity of ambulatory meri acute.

*Material examined*.—

143-34. Wenman Island, 100-150 fms, Jan. 11, 1934, 1 young specimen (photographed).

*Measurements*.—Young specimen: length 5.5 mm, width 6.2 mm.

*Habitat*.—Mud and crushed shell (Crane). *Velero III* records show rock, coral, and nullipore, presumably with sand.

*Depth*.—60-150 fms.

*Remarks*.—The single small specimen from deep water north of Wenman Island conforms remarkably with Miss Crane's description of the type, and also with a small specimen from the Gulf of California, particularly as regards the front, the two triangular teeth of which meet at almost a right angle. Extension of the range of *C. cortezi* to the Galapagos Islands is less surprising in view of the simultaneous extension of ranges of two other Gulf of California species, *C. lucasii* Rathbun and *C. fragilis* Rathbun.

*C. cortezi* is now recorded from the Galapagos Islands.

### ***Cymopolia lucasii* (Rathbun)**

Plate 87, Fig. 1

*Palicus lucasii* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 600, pl. 43, fig. 2, 1898.

*Cymopolia lucasii* Rathbun, Bull. 97, U.S. Nat. Mus., p. 193, pl. 44, figs. 1 and 2, text fig. 119, 1918. Crane, Zoologica, vol. 22, no. 3, p. 76, 1937.

*Type locality*.—Off Cape San Lucas, Lower California; 31 fms.

*Type*.—USNM No. 21590.

*Range*.—From Arena Bank, Gulf of California (*Zaca*), to Cape San Lucas (*Albatross*); 31-60 fms.

*Atlantic analogue*.—*C. faxoni* (Rathbun).

*Diagnosis*.—Carapace only one-eighth wider than long, tuberculate. Anterolateral margin with 2 acute teeth, excluding exorbital; supra-orbital teeth sharpened. Ambulatory legs wide; an acute lobe at distal end of merus of legs 1 and 2, that of leg 3 rounded.

*Material examined* (18 specimens from 11 stations).—

69a-33. Albemarle Point, Albemarle Island, 12 fms, mud sample, Feb. 11, 1933, 1 specimen.

148-34. Tagus Cove, Albemarle Island, 12-15 fms, Jan. 13, 1934, 1 male.

149-34. Tagus Cove, Albemarle Island, 20 fms, Jan. 13, 1934, 2 females, fragment.

157-34. Tagus Cove, Albemarle Island, 10-18 fms, Jan. 15, 1934, 2 males (1 photographed), 3 females.

177-34. Sullivan Bay, James Island, 5-20 fms, Jan. 23, 1934, 2 females.

201-34. Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 5 males, 1 female.

345-35. Off Daphne Islands, 30 fms, Dec. 13, 1934, 1 female.

361-35. Gardner Bay, Hood Island, 12 fms, Dec. 19, 1934, 1 male.

795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 2 females.

799-38. Cartago Bay, Albemarle Island, 15-18 fms, Jan. 22, 1938, 1 male.

*Measurements*.—Largest male: length 10.5 mm, width 12.4 mm, second ambulatory leg 20.0 mm.

*Color in life*.—Dragon's blood red and white. A solid median band of color extends longitudinally from front to posterior border, dividing the carapace into 3 approximately equal parts, the outer two of which are white. Anterolateral and preorbital teeth dragon's blood red, orbital tooth white. Legs banded with dragon's blood red, the wide propodal band brightest. Spines of merus, tips of dactyls, and entire reduced leg white. (Garth)

*Habitat*.—Muddy and sandy bottoms (Crane). *Velero III* records show sand and rock, sand and shell, sand and algae, and two stations: "coral, nullipore, and rock."

*Depth*.—5-60 fms.

*Remarks*.—A Galapagos Island specimen of this species, identified by its author, Miss Rathbun, was the first indication that Gulf of California *Cymopolias* might be expected in the Galapagos archipelago. Since that time two other Gulf species, *C. fragilis* Rathbun and *C. cortezi* Crane, as well as a new species, *C. velerae* Garth, have been found to occur in the Galapagos Islands.

*C. lucasii* is now recorded from the Galapagos Islands.

### ***Cymopolia fragilis* Rathbun**

Plate 85, Figs. 3, 4

*Cymopolia fragilis* Rathbun, Proc. U.S. Nat. Mus., vol. 16, p. 259, 1893; Bull. 97, U.S. Nat. Mus., p. 213, pl. 51, figs. 2 and 3, text fig. 129a and b, 1918.

*Cymopolia zaca* Glassell, Zoologica, vol. 21, no. 17, p. 217, 1936. Crane, Zoologica, vol. 22, no. 3, p. 76, pl. 8, fig. 26, 1937.

*Type locality*.—Off Lower California; 58 and 71 fms.

*Type*.—USNM No. 17485.

*Range*.—From northwest of Cedros Island, Lower California (*Albatross*), to Ecuador (*Albatross*), including the Gulf of California; 52-71 fms. (*Albatross*).

*Diagnosis*.—Carapace one and one-half times as wide as long. Four anterolateral teeth, excluding exorbital. First ambulatory leg short, not overreaching merus of second in male.

*Material examined* (124 specimens from a single station).—

143-34. Wenman Island, 100-150 fms, Jan. 11, 1934, 56 males, 65 females (including the photographed pair), 3 young.

*Measurements*.—Largest specimen, male: length 7.7 mm, width 12.3 mm, length of second ambulatory leg 22.5 mm; largest female; length 8.2 mm, width 11.7 mm, length of second ambulatory leg 22.8 mm. Note difference of proportions in the two sexes.

*Habitat*.—Bottom of coral, nullipores, and calcareous worm tubes.

*Depth*.—52-150 fms.

*Remarks*.—Specimens from Wenman Island were compared with the type of *C. zaca*e Glassell in the laboratories of the New York Zoological Society by Miss Jocelyn Crane, who found them to agree very nicely. Specimens from Wenman Island were also compared with the type of *C. fragilis* Rathbun at the U.S. National Museum, and were found to be the same. Evidence pointing to the synonymy of *C. zaca*e, which was said by Glassell (1936) to differ from *C. fragilis* in having 5 anterolateral spines instead of 4, in having the first leg extending past the merus of the second instead of falling short of it, in having the suborbital lobe truncate, instead of bilobed, and not equally advanced with the pterygostomial lobe, is as follows:

1. The inferior orbital lobe is truncate in the type specimen of *C. fragilis*, although bilobed on the photographed specimen (USNM No. 20620) from Ecuador.

2. The inferior orbital lobe makes an oblique line with the pterygostomial lobe, which is much more advanced on an anterior-posterior line. Wenman Island specimens and the type of *C. fragilis* are alike in this respect.

3. Both Wenman Island specimens and the type specimen of *C. fragilis* have 4 teeth if the exorbital tooth and the posterior marginal fold, which resembles a tooth, be excluded.

4. The first ambulatory leg is detached from the carapace of the type of *C. fragilis* and the other legs are rigid, making it impossible to tell whether or not the type had the first ambulatory leg overreaching the

merus of the second. In the Wenman Island specimens there is sufficient difference between merus lengths of the male and female to allow the male first leg to overreach and the female not.

### *Cymopolia velerae* Garth

Plate 85, Fig. 1

*Cymopolia velerae* Garth, Allan Hancock Pac. Exped., vol. 5, no. 2, p. 25, pl. 10, figs. 1-4.

*Type locality*.—Off Daphne Minor Island, Galapagos Islands, 70-80 fms.

*Type*.—AHF no. 386.

*Range*.—Throughout the Galapagos Islands, exclusive of the three northern islands, in depths of 3-80 fms (*Velero III*). (See *Remarks* below).

*Diagnosis*.—Five anterolateral teeth diminishing in size posteriorly. Outer suborbital lobe trilobed, inner sinus narrow. Outer slope of frontal lobe continuous with preorbital lobe. Supraorbital teeth broad, truncate. Merus of leg 2 with distal spine acuminate. Carapace 1.4 times wider than long; a sinuous posterior line of tubercles.

*Material examined* (111 specimens from 16 stations).—

55-33. Lat.  $1^{\circ} 03' 30''$  S, Long.  $90^{\circ} 17' 30''$  W, 60 fms, Feb. 5, 1933, 1 male.

147-34. Tagus Cove, Albemarle Island, 30 fms, Jan. 13, 1934, 1 female.

171-34. East of Wreck Bay, Chatham Island, 35-40 fms, Jan. 21, 1934, 3 females.

182-34. James Bay, James Island, 30 fms, Jan. 24, 1934, 1 male.

185-34. Cartago Bay, Albemarle Island, 32 fms, Jan. 25, 1934, 16 males, 15 females (5 ovig.), 3 fragments.

186-34. Cartago Bay, Albemarle Island, 32 fms, Jan. 25, 1934, 10 males, 2 ovig. females, 1 young.

190-34. Lat.  $0^{\circ} 55'$  S, Long.  $90^{\circ} 30'$  W, 58-60 fms, Jan. 26, 1934, 3 males, 7 females (3 ovig.), 2 young.

198-34. NW of Post Office Bay, 55-65 fms, Jan. 29, 1934, 1 ovig. female.

201-34. Off Gardner Bay, Hood Island, 25-35 fms, Jan. 31, 1934, 4 males, 1 young.

318-35. Off Gordon Rocks, Indefatigable Island, 45 fms, Dec. 8, 1934, 2 females (1 ovig.).

324-35. Tagus Cove, Albemarle Island, 45 fms, Dec. 10, 1934, 2 females.

- 346-35. Between South Seymour and Daphne Islands, 55 fms, Dec. 13, 1934, 1 male, 2 females, 2 fragments.
- 347-35. South Seymour Island, 3 fms, Dec. 13, 1934, 3 males.
- 792-38. Off Daphne Minor Island, 70-80 fms, Jan. 20, 1938, 2 males, 16 females, including the holotype (AHF no. 386).
- 795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 2 males, 1 female.
- 814-38. North of Hood Island, 20-40 fms, Jan. 28, 1938, 12 females.
- Measurements*.—Female holotype: length 6.9 mm, width 9.9 mm, length of second ambulatory leg 14.3 mm; largest male paratype: length 4.1 mm, width 4.9 mm.
- Habitat*.—Sand, sand and shell, sand and nullipore, sand and coral; mud, mud and shell, mud and sand; rock.
- Depth*.—3-80 fms.
- Remarks*.—This species was erroneously recorded as occurring in depths to 150 fms, apparently through inadvertency in including a Wenman Island station, at which only *C. fragilis* Rathbun and *C. cortezi* Crane were taken.

## Family *GRAPSIDAE*

### Subfamily *GRAPSINAE*

#### Genus *GRAPSUS* Lamarck, 1801

#### *Grapsus grapsus* (Linnaeus)

Plate 86, Figs. 1, 2

- Cancer grapsus* Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 630, 1758.
- Grapsus grapsus* Ives, Proc. Acad. Nat. Sci. Philadelphia, p. 190, 1891.
- Faxon, Mem. Mus. Comp. Zool., vol. 18, p. 30, 1895. Rathbun, Bull. 97, U.S. Nat. Mus., p. 227, pls. 53 and 54, and synonymy, 1918. Boone, Zoologica, vol. 8, no. 4, p. 244, fig. 90, 1927. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 18, 1933. Crane, Zoologica, vol. 22, no. 3, p. 77, 1937.
- Pachygrapsus crassipes* Boone, Zoologica, vol. 8, no. 4, p. 257, fig. 93, 1927.
- Type localities*.—America and Ascension Island.
- Types*.—Not extant.
- Range*.—San Benito Islands, Lower California (Anthony), to Molendo, Peru (Coker); Galapagos Islands (*Hassler*); occurs also in the Atlantic.
- Diagnosis*.—Carapace discoidal with transverse granular ridges. Front almost vertical. Fingers with spoon shaped tips.



*Material examined* (76 specimens from 22 stations).—

- 11-32. Conway Bay, Indefatigable Island, shore, Jan. 12, 1932, 2 males, 1 female.  
24-33. Gardner Bay, Hood Island, shore, Jan. 24, 1933, 2 males, 2 females, (1 ovig.).  
38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 4 males.  
42-33. Opposite Kicker Rock, Chatham Island, shore, Jan. 31, 1933, 1 male.  
48-33. Barrington Island, shore, Feb. 2, 1933, 1 male (soft shell).  
49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 2 males.  
52-33. Academy Bay, Indefatigable Island, shore, Feb. 4, 1933, 1 male.  
56-33. Flamingo Bay, Charles Island, shore, Feb. 5, 1933, 16 young.  
62-33. Black Bight, Albemarle Island, shore, Feb. 8, 1933, 3 young males.  
65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 5 young males.  
66-33. Tagus Cove, Albemarle Island, 10-20 fms, Feb. 9, 1933, 4 young.  
68-33. South of Cape Berkeley, Albemarle Island, shore, Feb. 10, 1933, 3 young males.  
69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 2 young males.  
85-33. North Seymour Island, shore, Feb. 18, 1933, 1 male.  
93-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 3 males (1 photographed), 1 female.  
98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 9 males, 1 female.  
146-34. Albemarle Point, Albemarle Island, shore, Jan. 12, 1934, 2 males, 1 large female.  
179-34. Bartholomew Island near James Island, shore, Jan. 23, 1934, 1 small male.  
184-34. James Bay, James Island, shore, Jan. 24, 1934, 1 young male.  
306-35. Marchena Island, shore, Dec. 2, 1934, 1 male.  
312-35. Black Beach, Charles Island, shore, Dec. 5, 1934, 1 young.  
815-38. East side of Hood Island, shore, Jan. 28, 1938, 4 males, 1 ovig. female.

*Measurements*.—A large male: length 65 mm, width 73 mm, cheliped 65 mm, chela 30 mm, dactyl 21 mm.

*Habitat*.—Lava rocks above water line (spray zone).

*Depth*.—Shore.

*Remarks*.—"Sally Lightfoot," as this well-known grapsoid crab is commonly called, is abundant on all the islands of the Galapagos group and, because of the contrast of its bright red carapace against jet black lava, the most conspicuous member of the crustacean fauna. The young are so unlike the adults as to have been mistaken for another species, as noted under *Pachygrapsus crassipes* Boone. The greenish-blue carapace is spattered with creamy dots and the slender legs appear longer in proportion to body size than in the more compact adult. Furthermore, the young are occasionally obtained in shallow dredging, a situation in which the adults would not be found. The loss of a leg or two to the bright-eyed Galapagos bittern, a bird which stalks these crabs relentlessly, seems but a temporary inconvenience, as a new appendage is soon regenerated.

Genus **GEOGRAPSUS** Stimpson, 1858  
**Geograpsus lividus** (H. Milne Edwards)

Plate 86, Figs. 3, 4

*Grapsus lividus* Milne Edwards, Hist. Nat. Crust., vol. 2, p. 85, 1837.

*Geograpsus lividus* Stimpson, Ann. Lyc. Nat. Hist. New York, vol. 7, p. 230, 1860. Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 604, 1898; Bull. 97, U.S. Nat. Mus., p. 232, pl. 55, and synonymy, 1918. Boone, Zoologica, vol. 8, no. 4, p. 251, fig. 91, 1927. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 19, 1933. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Type locality*.—Antilles.

*Type*.—In Paris Mus.

*Range*.—From La Paz, Lower California, (Belding), to Chile; Galapagos Islands (*Albatross*); occurs also in the Atlantic and in Hawaii.

*Diagnosis*.—Carapace subquadrate, sides little arched. Edge of front visible in dorsal view. Fingers with pointed tips. Legs conspicuously hairy.

*Material examined* (46 specimens from 14 stations).—

38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 2 males, 1 female.

49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 6 males, 1 female.

56-33. Flamingo Bay, Charles Island, shore, Feb. 5, 1933, 5 males, 5 females.

58-33. Cormorant Bay, Charles Island, shore, Feb. 6, 1933, 5 males, 1 female.

- 62-33. Black Bight, Albemarle Island, shore, Feb. 8, 1933, 2 males.  
68-33. South of Cape Berkeley, Albemarle Island, shore, Feb. 10, 1933, 3 males, 4 females.  
69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 1 female.  
82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 2 males.  
85-33. North Seymour Island, shore, Feb. 18, 1933, 1 male.  
153-34. Mangrove Point, Narborough Island, shore, Jan. 14, 1934, 1 male, 2 females.  
179-34. Bartholomew Island near James Island, shore, Jan. 23, 1934, 1 ovig. female.  
184-34. James Bay, James Island, shore, Jan. 24, 1934, 1 ovig. female.  
306-35. Marchena Island, shore, Dec. 2, 1934, 1 female (photographed).  
314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 1 ovig. female.

*Measurements*.—Largest specimen, female: length 30 mm, width 38 mm, cheliped 50 mm, chela 25 mm, dactyl 15.7 mm.

*Habitat*.—Rocky shore, above water line (spray zone).

*Depth*.—Shore.

*Remarks*.—*G. lividus* is a most secretive species in comparison with *Grapsus grapsus*, dwelling in crevices above the water line and darting into some deep recess upon the slightest sign of danger. Only the glint of the long, yellow hairs with which the walking legs are liberally provided reveals the hiding place of the species.

### Genus **PACHYGRAPSUS** Randall, 1840

#### **Pachygrapsus transversus** (Gibbes)

Plate 87, Fig. 2

*Grapsus transversus* Gibbes, Proc. Amer. Assoc. Adv. Sci., vol. 3, p. 181, 1850.

*Pachygrapsus transversus* Gibbes, Proc. Amer. Assoc. Adv. Sci., vol. 3, p. 182, 1850. Rathbun, Proc. Washington Acad. Sci., vol. 4, no. 8, p. 279, 1902; Bull. 97, U.S. Nat. Mus., p. 244, pl. 61, figs. 2 and 3, and synonymy, 1918. Boone, Zoologica, vol. 8, no. 4, p. 253, fig. 92, 1927. Finnegan, Journ. Linn. Soc. London, vol. 37, p. 649, 1931. Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 19, 1933. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Type locality*.—Key West, Florida.

*Type*.—Not extant.

*Range*.—From Agua Verde Bay, Gulf of California (*Albatross*), to Matapalo, Peru (Coker); Galapagos Islands (Jones); occurs also in the Atlantic.

*Diagnosis*.—Lateral margins strongly converging, bearing a single tooth just behind outer orbital tooth at widest part of carapace. Edge of front sinuous. Distal extremity of merus of fourth leg finely dentate.

*Material examined* (214 specimens from 40 stations).—

- 24-33. Gardner Bay, Hood Island, shore, Jan. 24, 1933, 8 males, 6 females.
- 27-33. Gardner Bay, Hood Island, shore, Jan. 25, 1933, 1 ovig. female.
- 30-33. Gardner Bay, Hood Island, shore, Jan. 26, 1933, 53 males, 23 females (12 ovig.).
- 38-33. SE of Cormorant Point, Charles Island, Jan. 29, 1933, 1 ovig. female.
- 48-33. Barrington Island, shore, Feb. 2, 1933, 6 males, 3 ovig. females.
- 49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 3 males, 1 ovig. female.
- 52-33. Academy Bay, Indefatigable Island, shore, Feb. 4, 1933, 5 males, 1 ovig. female.
- 56-33. Flamingo Bay, Charles Island, shore, Feb. 5, 1933, 1 male.
- 62-33. Black Bight, Albemarle Island, shore, Feb. 8, 1933, 1 male.
- 65-33. Reef north of Tagus Hill, Albemarle Island, reef, Feb. 9, 1933, 8 males, 2 females.
- 69-33. Albemarle Point, Albemarle Island, shore, Feb. 11, 1933, 2 males, 2 females (1 ovig.).
- 71-33. James Bay, James Island, shore, Feb. 12, 1933, 1 male, 1 female.
- 73-33. Cartago Bay, Albemarle Island, shore, Feb. 13, 1933, 1 male.
- 76-33. Cartago Bay, Albemarle Island, shore, Feb. 14, 1933, 1 male, 1 female.
- 82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 3 males, 7 females (3 ovig.).
- 85-33. North Seymour Island, shore, Feb. 18, 1933, 4 males, 2 females.
- 93-33. Darwin Bay, Tower Island, lagoon, Feb. 22, 1933, 3 males, 3 females.
- 96-33. Darwin Bay, Tower Island, shore, Feb. 24, 1933, 1 male, 6 females.

- 98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 1 male (photographed), 1 female.
- 146-34. Albemarle Point, Albemarle Island, shore, Jan. 12, 1934, 1 male, 3 females (1 ovig.), 1 young.
- 153-34. Mangrove Point, Narborough Island, shore, Jan. 14, 1934, 1 male.
- 154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1933, 1 male.
- 168-34. Academy Bay, Indefatigable Island, shore, Jan. 20, 1934, 1 male, 1 ovig. female.
- 168a-34. Academy Bay, Indefatigable Island, coral, Jan. 20, 1934, 3 young.
- 174-34. South Seymour Island, shore, Jan. 22, 1934, 2 females.
- 175-34. North Seymour Island, shore, Jan. 22, 1934, 1 male, 1 ovig. female.
- 179-34. Bartholomew Island near James Island, shore, Jan. 23, 1934, 1 male, 2 females.
- 180-34. Sullivan Bay, James Island, coral, Jan. 23, 1934, 1 specimen.
- 199a-34. Post Office Bay, Charles Island, shore, Jan. 30, 1934, 1 female.
- 202-34. Gardner Bay, Hood Island, shore, Jan. 31, 1934, fragment.
- 306-35. Marchena Island, shore, Dec. 2, 1934, 5 males, 3 ovig. females.
- 312-35. Black Beach, Charles Island, shore, Dec. 5, 1934, 1 male.
- 314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 2 males, 1 ovig. female.
- 333-35. James Bay, James Island, shore, Dec. 11, 1934, 2 males.
- 343-35. Sullivan Bay, James Island, shore, Dec. 12, 1934, 1 male.
- 354-35. Wreck Bay, Chatham Island, shore, Dec. 15, 1934, 1 male, 1 female.
- 359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 3 males, 3 females (1 ovig.).
- 782-38. Darwin Bay, Tower Island, shore, Jan. 16, 1938, 1 male, 2 females, 1 young.
- 789-38. South Seymour Island, shore, Jan. 19, 1938, fragment.
- 796-38. Sullivan Bay, James Island, shore, Jan. 21, 1938, 1 young.

*Measurements.*—Largest specimen, male: length 19 mm, width 23.3 mm, cheliped 32 mm, chela 18 mm, dactyl 12.8 mm.

*Color in life.*—General appearance black, chela shading to purple on outer margin of movable finger. A strip of apple green shows on either side of the carpus at point of articulation with next segment. Abdomen hazel brown. (Garth)

*Habitat*.—Rocky shore.

*Depth*.—Shore.

*Remarks*.—After a microscopic examination of over 200 *Pachygrapsus* from the Galapagos Islands, most of which are minute, it appears that all have the distal extremity of the merus of the last ambulatory leg finely dentate and so must be classified as *P. transversus* (Gibbes) instead of as *P. crassipes* Randall (1839), in which the merus is entire. Since Boone (1927, p. 257) figures and describes as *crassipes* a young *Grapsus grapsus* (Linnaeus), there remains but a single record of the occurrence in the Galapagos Islands of *P. crassipes*, that of Rathbun (1902). The identification of this specimen is correct, as verified by Mr. G. P. Ashcraft. The error, if there be one, is on the label. The specimen (USNM No. 25663) is one of three (2 males, 1 female) taken by the Hopkins-Stanford Expedition in 1898-99 and recorded from Tagus Cove, Albemarle Island, in 12 fathoms of water. Other species taken at this station were *Micropanope polita* (Rathbun), *Medaeus spinulifer* (Rathbun), *Portunus (Achelous) angustus* Rathbun, *Stenorynchus debilis* (Smith), *Podochela margaritaria* Rathbun, and *Microphrys triangulatus* (Lockington). While it is normal for the above-mentioned species to be found in 12 fathoms, it is not usual to encounter *P. crassipes* outside the intertidal zone; in fact, records of its occurrence at any depth at all are nonexistent. Although it is possible that there may have been a shore station of the same day at which *P. crassipes* was collected, to be later inadvertently placed in a bottle containing the dredged specimens, it is more probable that the *crassipes* was collected at a more northerly station. This is borne out by the fact that in his unpublished personal notes R. E. Snodgrass records spending a day ashore on the south end of Guadalupe Island at Whaler's Bay, where *crassipes* is abundant. Until further specimens are obtained to substantiate this Galapagos record, it seems unwise to consider *crassipes* a member of the Galapagan fauna.

#### Genus **PLANES** Leach

#### **Planes minutus** (Linnaeus)

*Cancer minutus* Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 625, 1758.

*Planes minutus* Verrill, Trans. Conn. Acad. Arts and Sci., vol. 13, p. 325, pl. 13, figs. a-j'; pl. 27, fig. 6; text fig. 7, 1908. Rathbun, Proc. Washington Acad. Sci., vol. 4, no. 8, p. 278, 1902; Bull. 97, U.S. Nat. Mus., p. 253, pl. 63, 1918. Boone, Zoologica, vol. 8, no. 4, p. 259, fig. 94, 1927. Crane, Zoologica, vol. 22, no. 3, p. 77, 1937.

*Type locality*.—"in *Pelagi Fuco natante*."

*Type*.—Not extant.

*Range*.—From Humboldt Bay, California (Dall), to Payta, Peru (Jones); Galapagos Islands (*Albatross*); also occurs in the Atlantic.

*Diagnosis*.—Carapace smooth, bare, convex in both directions, length and breadth subequal. Frontal width approximately half of carapace width, front entire or slightly bilobed. A small lateral tooth behind outer orbital tooth.

*Material examined*.—None from Galapagos.

*Remarks*.—While the writer has examined as many living sea turtles on Galapagos beaches as are likely to come under the observation of one collector, he has not been fortunate in finding this pelagic species in the situation from which it has been reported, about the reptile's venter. Like *Plagusia immaculata* Lamarck, which rides upon drifting logs, its occurrence depends to a large extent upon the vagaries of ocean currents and eddies.

#### Subfamily VARUNINAE

Genus **EUCHIROGRAPSUS** Milne Edwards, 1853

**Euchirograpsus americanus** A. Milne Edwards

Plate 85, Figs. 5, 6

*Euchirograpsus americanus* A. Milne Edwards, Bull. Mus. Comp. Zool., vol. 8, p. 18, 1880. Rathbun, Bull. 97, U.S. Nat. Mus., p. 282, pl. 74, text fig. 144, 1918.

*Type locality*.—Barbados, 69 fms.

*Type*.—Cotypes in MCZ, No. 6132.

*Range*.—From off South Carolina (*Albatross*) to off Santa Lucia (*Blake*); Caribbean Sea; 42-278 fms.

*Diagnosis*.—Carapace squarish, covered with pubescence. A single lobe on the inner surface of the merus of the third maxilliped. Three small spines behind outer orbital spine on margins of carapace. Legs hairy with conspicuous bands of orange red.

*Material examined* (Two specimens from as many stations).—

186-34. Cartago Bay, Albemarle Island, 32 fms, Jan. 25, 1934, 1 female.

795-38. Sullivan Bay, James Island, 35-40 fms, Jan. 21, 1938, 1 male (photographed).

*Measurements*.—Largest specimen, male: length 11.8 mm, width 13.3 mm, cheliped 19.0 mm, chela 10.0 mm, dactyl 5.7 mm.

*Color in life*.—Ground color light apricot orange, a shade darker on frontal portion of carapace, which is marked by delicate orange-red blotches and small orange-red dots. Eye green. Chelae apricot orange

with ridges of orange red; tips of teeth white. Ambulatory legs apricot orange banded with orange red on merus, carpus, and propodus, and dactylus. Tip of nail white. (Petersen)

*Habitat*.—Coarse sand and nullipore; sand and rock.

*Depth*.—32-278 fms.

*Remarks*.—The specimens have been compared with the cotypes from Barbados at Harvard MCZ by Dr. Fenner Chace and with a male and two females taken off Santa Lucia by Captain E. Cole of the *Blake* in the collections of the U.S. National Museum. Concerning the former comparison Dr. Chace writes: "From the specimens I have seen, both Atlantic and Pacific, I do not believe the latter deserve a specific designation at this time." With this sentiment the writer, in his examination of the *Blake* specimens, is in perfect agreement.

*E. americanus* is now recorded for the first time in Pacific waters.

#### Subfamily **PLAGUSIINAE**

Genus **PLAGUSIA** Latreille, 1806

**Plagusia immaculata** Lamarck

*Plagusia immaculata* Lamarck, Hist. Nat. Anim. sans Vert., vol. 5, p. 247, 1818. Rathbun, Bull. 97, U.S. Nat. Mus., p. 335, pl. 103, 1918. Boone, Zoologica, vol. 8, no. 4, p. 264, fig. 95, 1927.

*Type locality*.—Mediterranean Sea or Indian Ocean.

*Type*.—In Paris Mus.

*Range*.—From Punta Arenas, Costa Rica (Biolley), to Taboga Island, Panama (Meek and Hildebrand); Galapagos Islands (*Arcturus*); also Indo-Pacific.

*Diagnosis*.—Carapace subcircular, depressed, covered with low tubercles or squamae, lateral margin toothed. Meri of ambulatory legs with an anterodistal spine, legs conspicuously hairy.

*Material examined*.—None from Galapagos Islands. Hancock collections contain a series from Cocos Island, Costa Rica.

*Remarks*.—A pelagic species, the Pacific Log Rider is to be expected whenever the warm Niño current carries floating rafts southwestward from the Bay of Panama.

Genus **PERCNON** Gistel, 1848

**Percnon gibbesi** (Milne Edwards)

Plate 86, Figs. 5, 6

*Acanthopus gibbesi* Milne Edwards, Ann. Sci. Nat., ser. 3, Zool., vol. 20, pp. 180 and 146, 1853.



*Percnon gibbesi* Rathbun, Bull. 97, U.S. Nat. Mus., p. 337, pl. 105, 1918.

Hult, Arkiv. för Zoologi, Band 30A, no. 5, p. 14, 1938. Schmitt, Smithsonian Misc. Col., vol. 98, no. 6, p. 25, 1939.

*Type locality*.—Antilles.

*Type*.—In Paris Mus.

*Range*.—From Cape San Lucas, Lower California, to Chile; Galapagos Islands (Hult); occurs also in the Atlantic.

*Diagnosis*.—Carapace exceedingly flat and depressed, disclike. Legs long and slender; anterior margins of meri armed with strong spines. Chelae of adult male bulbous but compressed.

*Material examined* (28 specimens from 9 stations).—

33-33. Black Beach, Charles Island, shore, Jan. 27, 1933, 1 female.

38-33. SE of Cormorant Point, Charles Island, shore, Jan. 29, 1933, 3 males, 5 females (1 ovig.).

98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 1 ovig. female.

101-33. Darwin Bay, Tower Island, shore, Feb. 26, 1933, 1 male.

154-34. Reef north of Tagus Hill, Albemarle Island, reef, Jan. 15, 1934, 2 females.

313-35. Black Beach, Charles Island, shore, Dec. 6, 1934, 1 female.

359-35. Osborn Island in Gardner Bay, Hood Island, shore, Dec. 19, 1934, 2 males, 3 females.

784-38. Darwin Bay, Tower Island, shore, Jan. 17, 1938, 4 males, 2 females (1 photographed).

789-38. South Seymour Island, shore, Jan. 19, 1938, 2 males, 1 young, fragment.

*Measurements*.—Largest specimen, female: length 32.5 mm, width 34.3 mm; largest male: length 30.0 mm, width 27.7 mm, cheliped 32.0 mm, chela 14.0 mm, height of palm 9.0 mm, dactyl 7.4 mm. These specimens are of exceptional size.

*Color in life*.—Carapace and merus of ambulatory legs brown above. A fine white line bisecting carapace into right and left halves. Carpus, propodus, and dactylus show increasing amounts of chrome orange, the brown superior band narrowing with each article. Eyestalks and chelae orange, though paler than legs. (Garth)

*Habitat*.—Under large, turnable rocks in shallow, turbulent water.

*Depth*.—Shoal water.

*Remarks*.—The Spray Crab is found in white water of knee to hip depth. Its extreme flatness and propensity for keeping always on the under side no matter how rapidly the rock is turned make *P. gibbesi* the most difficult to capture of all the Galapagos Grapsidae. Undoubtedly, many more specimens are present than are seen.

*P. gibbesi* was first taken in the Galapagos Islands by *Velero III* collectors.

A key to the genus *Percnon* is given by Schmitt (1939, p. 23).

Family **OCYPODIDAE**

Subfamily **OCYPODINAE**

Genus **OCYPODE** Fabricius, 1798

**Ocypode gaudichaudii** Milne Edwards and Lucas

Plate 87, Fig. 7

*Ocypoda gaudichaudii* Milne Edwards and Lucas, d'Orbigny's Voy. dans l'Amer. Merid., vol. 6, Crust., p. 26, 1843; vol. 9, atlas, pl. 11, figs. 4-4b, 1847.

*Ocypode gaudichaudii* Rathbun, Proc. U.S. Nat. Mus., vol. 21, p. 603, 1898; Bull. 97, U.S. Nat. Mus., p. 373, pl. 129, fig. 1; pl. 130, fig. 1, 1918; *not* Zoologica, vol. 5, no. 14, p. 155, pl. 7, figs. 1-3. Boone, Zoologica, vol. 8, no. 4, p. 267, fig. 96A, 1927 (*not* fig. 96B). Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 19, 1933. Crane, Zoologica, vol. 25, p. 65, 1940.

*Type locality*.—Chile.

*Type*.—In Paris Mus.

*Range*.—Gulf of Fonseca, Salvador (MCZ), to Chile (MCZ); Galapagos Islands (*Albatross*).

*Diagnosis*.—Carapace subcylindrical, granulate. Front narrow, one-seventh or less of carapace width. Eyestalks extending beyond cornea. Fingers truncate.

*Material examined* (47 specimens from 12 stations).—

10-32. James Bay, James Island, shore, Jan. 9, 1932, 3 males.

13-32. Darwin Bay, Tower Island, shore, Jan. 20, 1932, 1 female.

42-33. Opposite Kicker Rock, Chatham Island, shore, Jan. 31, 1933, 6 males (1 photographed), 5 females.

58-33. Cormorant Bay, Charles Island, shore, Feb. 6, 1933, 1 male.

71-33. James Bay, James Island, shore, Feb. 12, 1933, 5 males, 2 females.

82-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 1 male.

85-33. North Seymour Island, shore, Feb. 18, 1933, 1 female.

88-33. South Seymour Island, shore, Feb. 19, 1933, 11 males, 2 females.

175a-34. South Seymour Island, shore, Jan. 22, 1934, 2 females.

332-35. Two miles south of Tagus Cove, Albemarle Island, shore, Dec. 10, 1934, 1 male.

333-35. James Bay, James Island, shore, Dec. 11, 1934, 1 male.

789-38. South Seymour Island, shore, Jan. 19, 1938, 4 males, 1 female.

*Measurements*.—Largest specimen, male: length 35 mm, width 46 mm, cheliped (rigid) coxa to elbow 30 mm, elbow to tip of dactyl 30 mm, chela 30 mm, dactyl 17.4 mm.

*Color in life*.—General appearance light coral pink, slightly darker on posterior regions and ambulatory legs. Merus of cheliped light coral red, carpus coral pink, manus pinkish with yellowish crest. Eyestalks bright coral red, eye pale lilac, almost white, with longitudinal dark brown cornea ending in a coral pink spine. Dactyls with pale yellowish tinge. (Petersen)

*Habitat*.—In burrows on sandy beaches.

*Depth*.—Shore.

*Remarks*.—The Ghost Crab or Cart Driver, El Carretero, as he is called in Latin America, is found only on the hard-packed sand beaches which occur much less frequently in the Galapagos Islands than the rocky shoreline. Two striking differences separate *O. gaudichaudii* from the species of the Mexican coast, *O. occidentalis* Stimpson 1860; the eyestalks are prolonged beyond the cornea and the tips of the dactyls are truncate.

Crane (1940, p. 70) presents convincing evidence that the megalops described and figured by Rathbun (1924, p. 155, pl. 7) as (?) *Ocypode gaudichaudii* and repeated by Boone (1927, p. 271, fig. 96B) with photographic illustration and without the question mark should be referred instead to the genus *Plagusia* because of its grapsid, rather than ocypodid, characters.

### Genus *UCA* Leach, 1814

#### KEY TO THE GALAPAGOS SPECIES OF THE GENUS *Uca*

- A<sup>1</sup> Front less than one-third width of carapace. No granular ridge on superior margin of palm. Size small . . . *U. helleri*  
A<sup>2</sup> Front about one-third width of carapace. A granular ridge on superior margin of palm. Size large . . . *U. galapagensis*

### *Uca galapagensis* Rathbun

Plate 87, Figs. 3, 4

*Uca galapagensis* Rathbun, Proc. Washington Acad. Sci., vol. 4, p. 275, pl. 12, figs. 1 and 2, 1902; Bull. 97, U.S. Nat. Mus., p. 403, pl. 142, text fig. 167a and b, 1918; Zoologica, vol. 5, no. 14, p. 155, 1924. Boone, Zoologica, vol. 8, no. 4, p. 271, fig. 97, upper figure, 1927; not fig. 97, lower figure, which is *Uca panamensis*, (Stimpson). Sivertsen, Med. fra det Zool. Mus., Oslo, nr. 38, p. 20, 1933. Hult, Arkiv för Zoologi, Band 30A, no. 5, p. 14, 1938.

*Uca macrodactyla* Crane, Zoologica, vol. 26, no. 19, p. 178, 1941; part: the Galapagos specimen.

*Type locality*.—Indefatigable Island.

*Type*.—USNM No. 22319.

*Range*.—Known only from the Galapagos Islands, Indefatigable, James, and Seymour.

*Diagnosis*.—Superior margin of palm with a granular ridge. Orbital margins moderately oblique. Front about one-third width of carapace. Size large.

*Material examined* (173 specimens from 6 stations).—

8-32. E. of Post Office Bay, Charles Island, shore, Jan. 3, 1932, 16 males, 3 females, fragment.

39-33. Flamingo Lagoon, Charles Island, shore, Jan. 29, 1933, 39 males, 12 females, (including photographed pair).

49-33. Academy Bay, Indefatigable Island, shore, Feb. 3, 1933, 29 males, 19 females.

82a-33. Conway Bay, Indefatigable Island, shore, Feb. 17, 1933, 2 males.

88-33. South Seymour Island, shore, Feb. 19, 1933, 38 males, 15 females.

314-35. Academy Bay, Indefatigable Island, shore, Dec. 7, 1934, 5 males, 2 females.

*Measurements*.—Largest specimen, male: length 14.6 mm, width 22.1 mm, cheliped 60 mm, chela 38.6 mm, dactyl 28 mm; female: length 13.5 mm, width 19.6 mm.

*Habitat*.—In mud flats of brackish lagoons.

*Depth*.—Shore.

*Remarks*.—Brackish water and claylike soil are sought by the fiddler crabs in general. The Galapagos species, *U. galapagensis* Rathbun, thrives equally well in a pinkish muck at Charles Island or a red-orange gumbo at South Seymour Island. The Academy Bay specimens, living in gray mud, attain the greatest size.

The Eden Island specimen figured by Boone (1927, fig. 97, upper figure) has been examined through the kindness of Miss Jocelyn Crane of the New York Zoological Society and found to be in close agreement with the large series of *galapagensis* taken by *Velero III* collectors at Academy Bay, on the opposite side of Indefatigable Island. In view of this fact and the fact that Miss Crane considers the specimen to be *atypical* as *U. macrodactyla*, the specimen is here referred once more to the established Galapagos species until others unquestionably of the latter species put in an appearance.

***Uca helleri* Rathbun**

Plate 87, Figs. 5, 6

*Uca helleri* Rathbun, Proc. Washington Acad. Sci., vol. 4, p. 277, pl. 12, figs. 3 and 4, 1902; Bull. 97, U.S. Nat. Mus., p. 415, pl. 151, text fig. 170a and b, 1918. Boone, Zoologica, vol. 8, no. 4, p. 278, fig. 98, 1927. Crane, Zoologica, vol. 26, no. 19, p. 198, text figs. 4R, 5, 1941.

*Type locality*.—Mangrove Point, Narborough Island, Galapagos Islands.

*Type*.—USNM. No. 24829.

*Range*.—Albemarle, Narborough, and Tower Islands, Galapagos Islands.

*Diagnosis*.—Superior margin of palm without granular ridge. Orbital margins strongly oblique. Front less than one-third width of carapace. Size small.

*Material examined* (225 specimens from 5 stations).—

52-33. Academy Bay, Indefatigable Island, shore, Feb. 4, 1933, 14 males, 11 females (2 ovig.).

62-33. Black Bight, Albemarle Island, shore, Feb. 8, 1933, 63 males, 38 females (4 ovig.), (including photographed pair).

93-33. Darwin Bay, Tower Island, shore, Feb. 22, 1933, 50 males, 43 females (3 ovig.).

98-33. Darwin Bay, Tower Island, shore, Feb. 25, 1933, 4 males, 1 female.

153-34. Mangrove Point, Narborough Island, shore, Jan. 14, 1934, 1 male.

*Measurements*.—Large specimen, male: length 8.2 mm, width 12.3 mm, cheliped 32 mm, chela 21.4 mm, dactyl 15.5 mm; female: length 8.0 mm, width 11.0 mm.

*Habitat*.—Sandy mud beneath mangrove roots.

*Depth*.—Shore.

*Remarks*.—*U. helleri* and *U. galapagensis* Rathbun are found in separate colonies and on separate islands except at Academy Bay, where they occur in adjacent coves. The Academy Bay record is an extension of range for *U. helleri*.

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EXPLANATION  
OF  
PLATES

## PLATE 49

*Raninoides ecuadorensis* Rathbun (p. 344)

Male paratype

- Fig. 1 Dorsal view
- Fig. 2 Outline of front
- Fig. 3 Outline of wrist and hand
- Fig. 4 Fourth walking leg
- Fig. 5 First walking leg



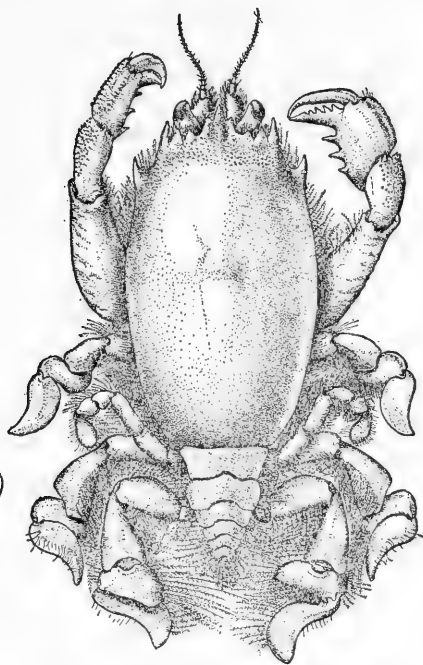
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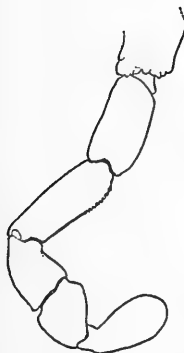
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3



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2mm.

4



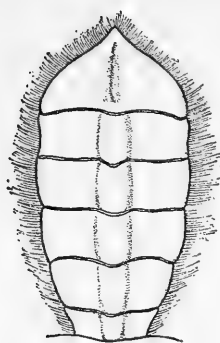
2mm.

5

## PLATE 50

*Clythrocerus laminatus* Rathbun (p. 353)

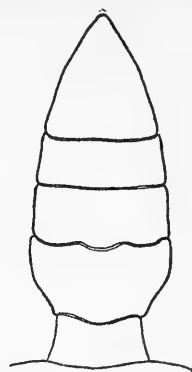
- Fig. 1 Dorsal view, male
- Fig. 2 Right chela, male
- Fig. 3 Abdomen, female
- Fig. 4 Abdomen, male
- Fig. 5 Left outer maxilliped
- Fig. 6 Right cheliped, female
- Fig. 7 Right cheliped, male



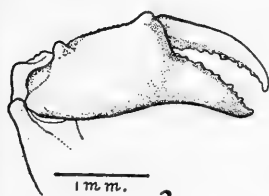
1 m m. 3



½ m m. 5



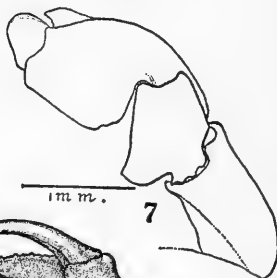
½ m m. 4



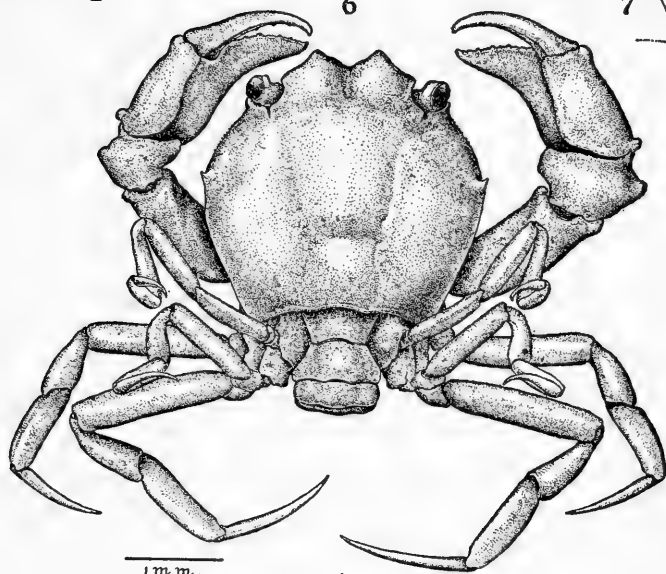
1 m m. 2



1 m m. 6



1 m m. 7



1 m m.

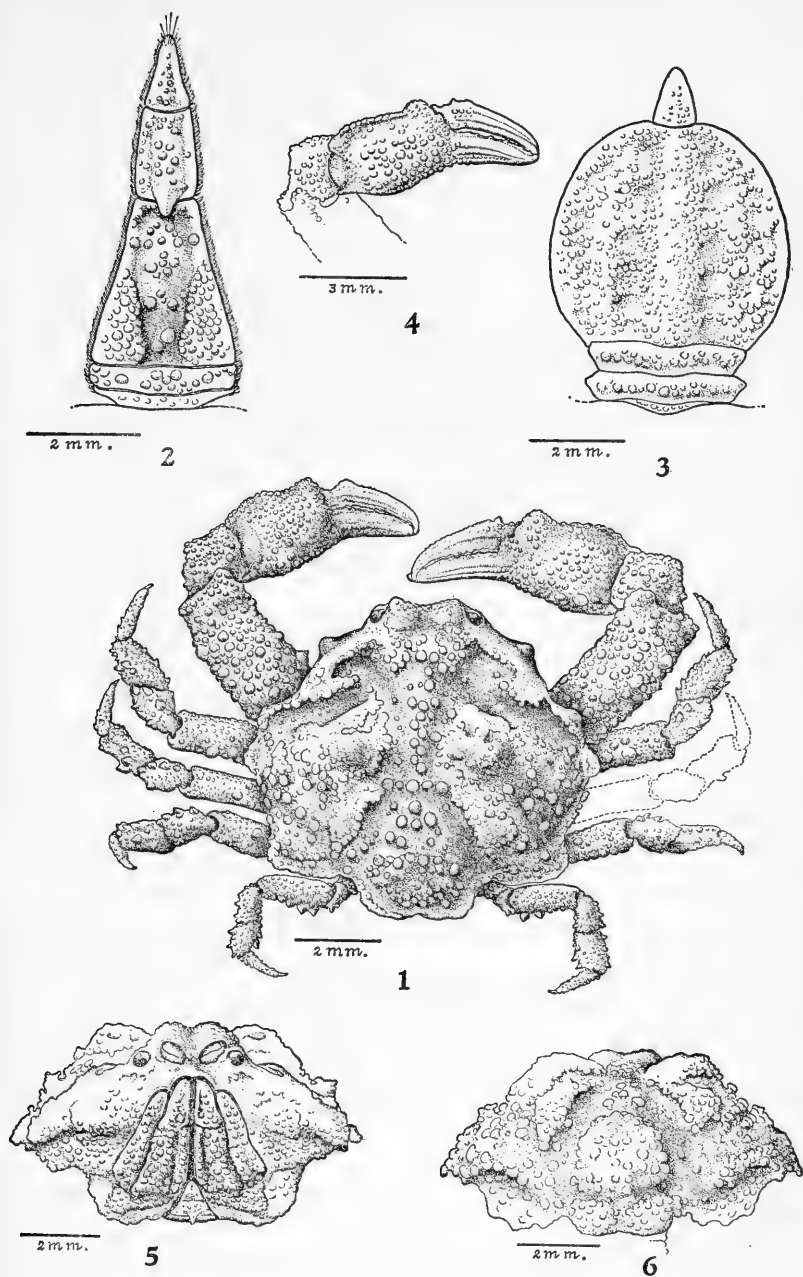
1

## PLATE 51

*Ebalia hancocki* Rathbun (p. 354)

- Fig. 1 Dorsal view, male
- Fig. 2 Abdomen, male
- Fig. 3 Abdomen, female
- Fig. 4 Right chela
- Fig. 5 Frontal view of carapace
- Fig. 6 Posterior view of carapace

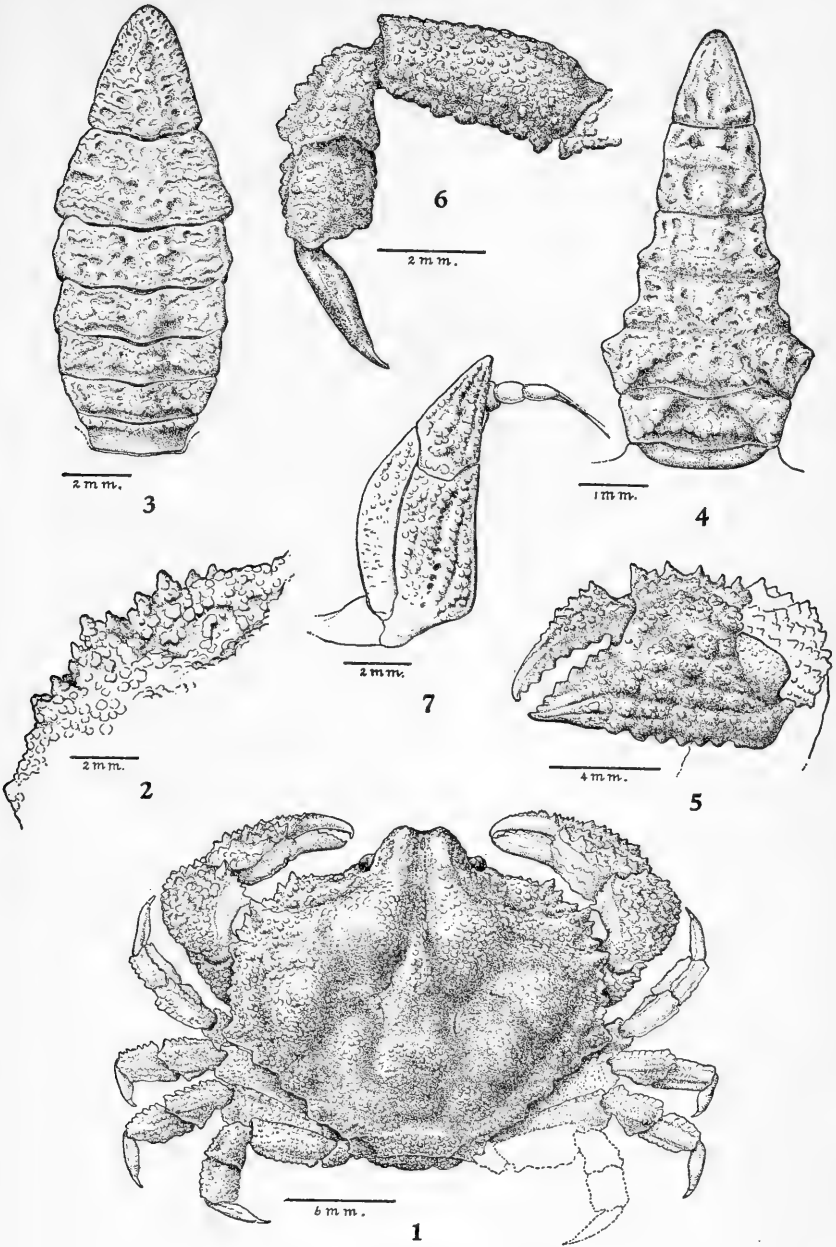




## PLATE 52

*Osachila galapagensis* Rathbun (p. 364)  
Female paratype

- Fig. 1 Dorsal view
- Fig. 2 Detail of anterolateral margin
- Fig. 3 Abdomen
- Fig. 4 Abdomen, male
- Fig. 5 Left chela
- Fig. 6 Left fourth ambulatory leg
- Fig. 7 Right outer maxilliped

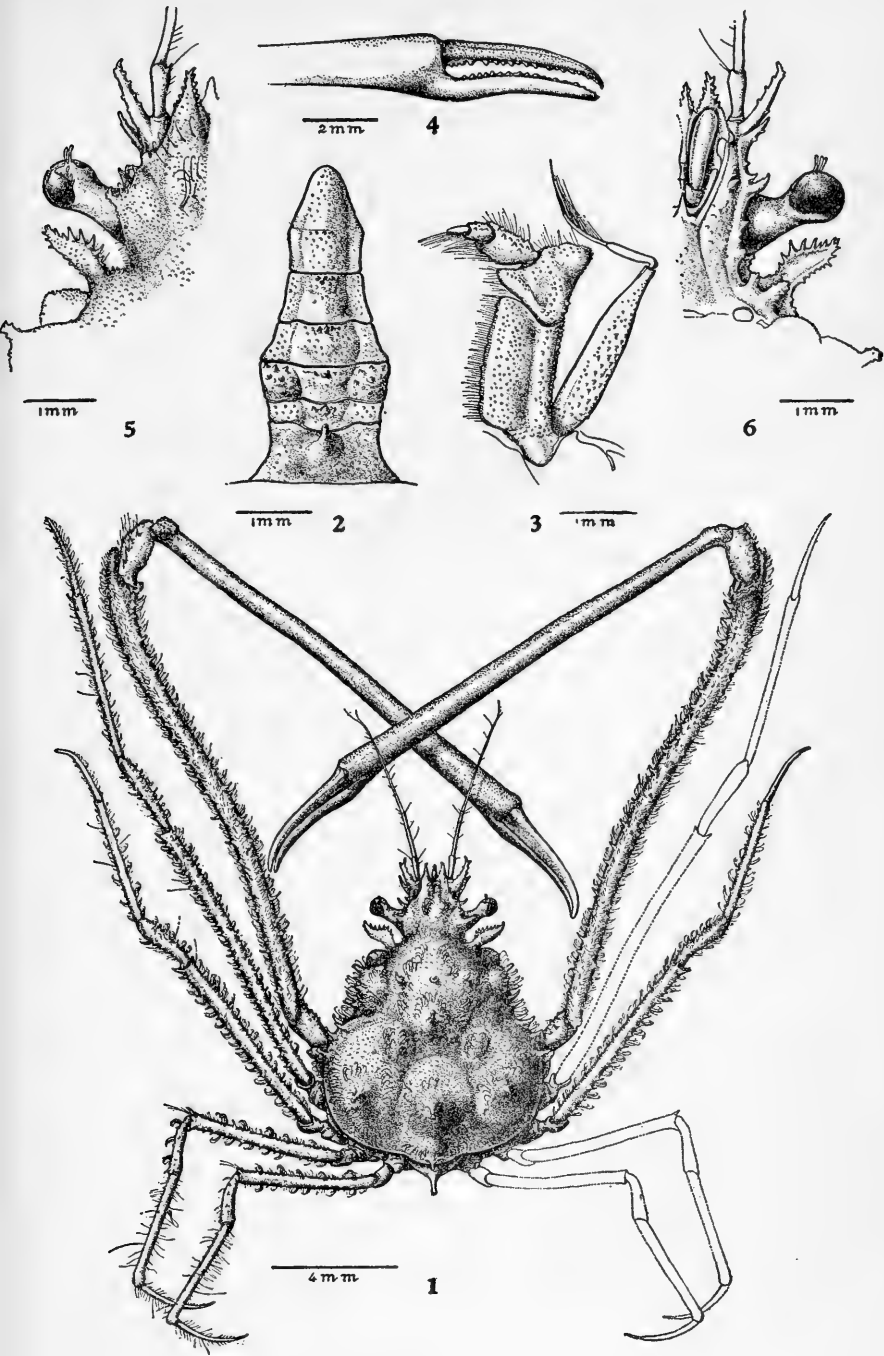


## PLATE 53

*Euprognatha granulata* Faxon (p. 372)

Male

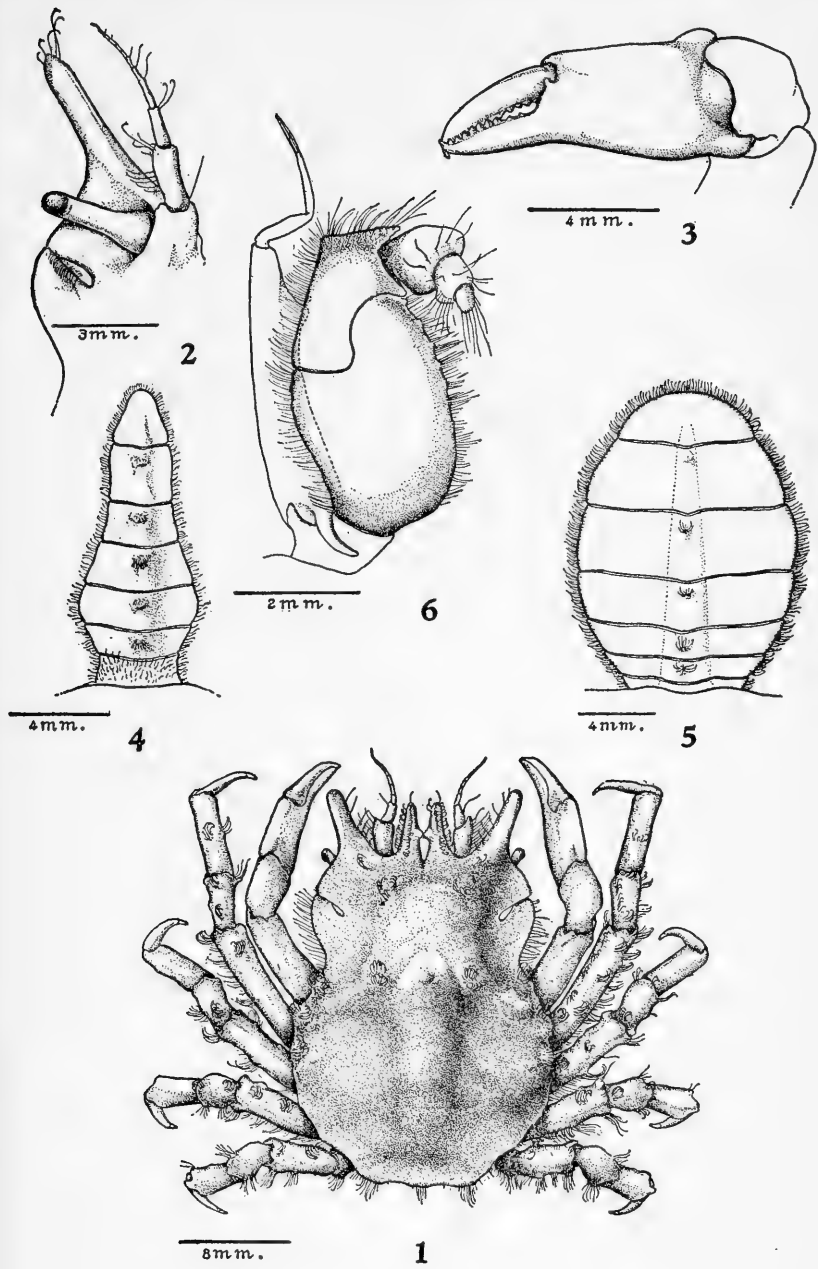
- Fig. 1 Dorsal view
- Fig. 2 Abdomen
- Fig. 3 Left outer maxilliped
- Fig. 4 Right chela
- Fig. 5 Dorsal view of orbit
- Fig. 6 Ventral view of orbit



## PLATE 54

*Tyche lamellifrons* Bell (p. 406)

- Fig. 1 Dorsal view, female
- Fig. 2 Ventral view of orbit
- Fig. 3 Left chela, male
- Fig. 4 Abdomen, male
- Fig. 5 Abdomen, female
- Fig. 6 Right outer maxilliped

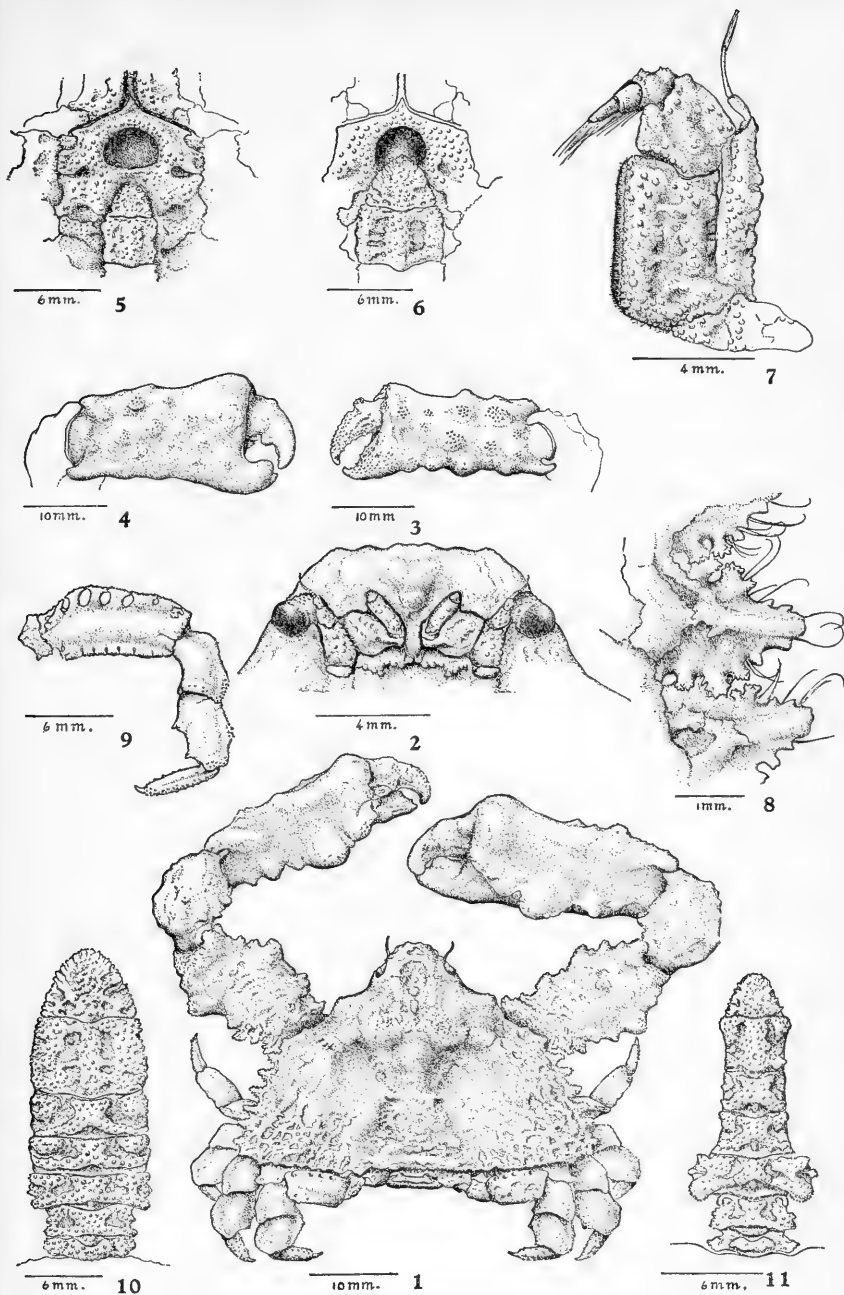


## PLATE 55

*Daldorfia garthi* Glassell (p. 412)

- Fig. 1 Dorsal view
- Fig. 2 Frontal view
- Fig. 3 Minor chela
- Fig. 4 Major chela
- Fig. 5 Sternal pit, showing position of male abdomen
- Fig. 6 Sternal pit, showing position of female abdomen
- Fig. 7 Left outer maxilliped
- Fig. 8 Detail of lateral teeth
- Fig. 9 Right third ambulatory leg
- Fig. 10 Female abdomen
- Fig. 11 Male abdomen



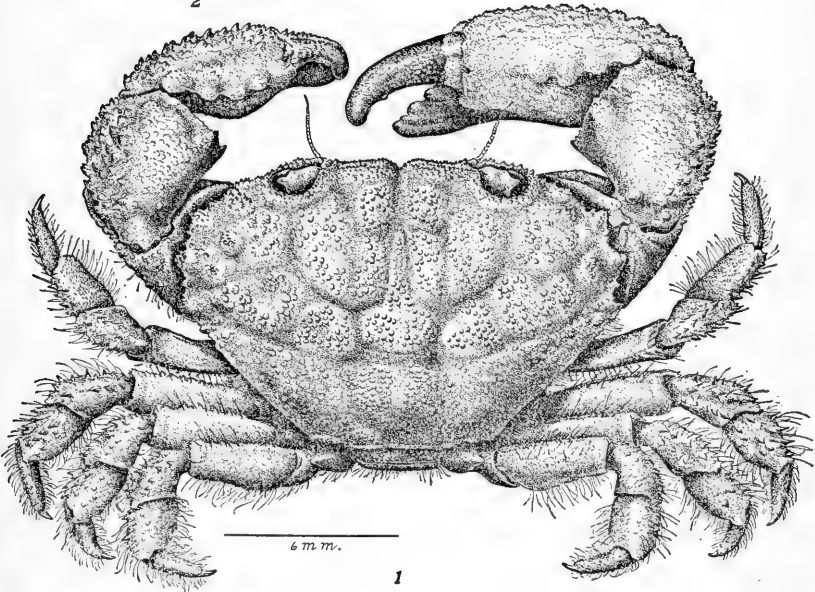
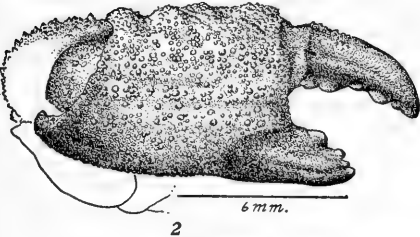
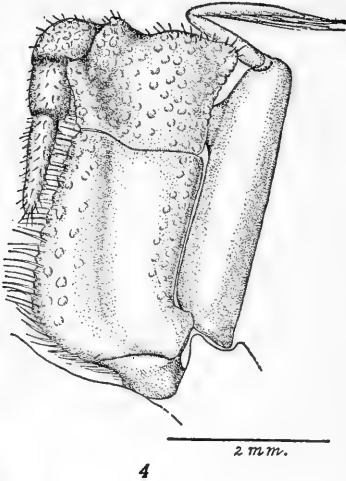
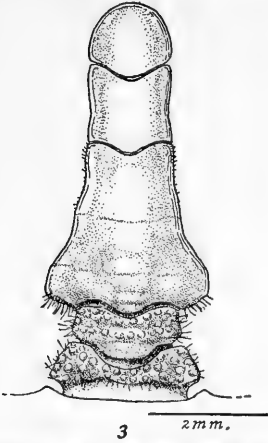


## PLATE 56

*Actaea crosslandi* (Finnegan) (p. 436)

Male

- Fig. 1 Dorsal view
- Fig. 2 Right chela
- Fig. 3 Abdomen
- Fig. 4 Left outer maxilliped

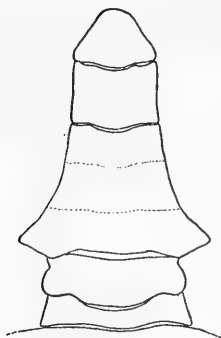


## PLATE 57

*Micropanope fraseri*, new species (p. 462)

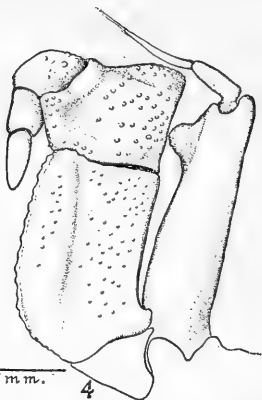
Male holotype

- Fig. 1 Dorsal view
- Fig. 2 Frontal view of chelae
- Fig. 3 Abdomen
- Fig. 4 Left outer maxilliped



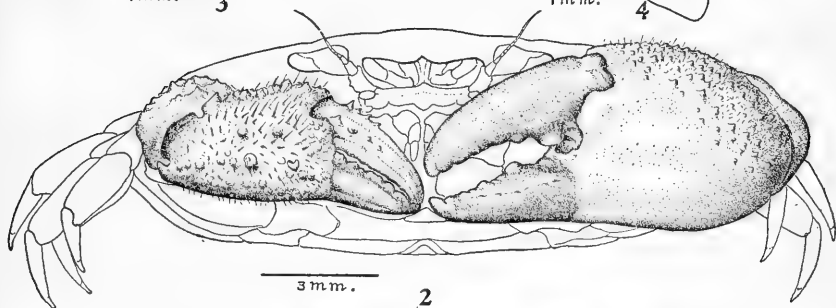
1 m. m.

3



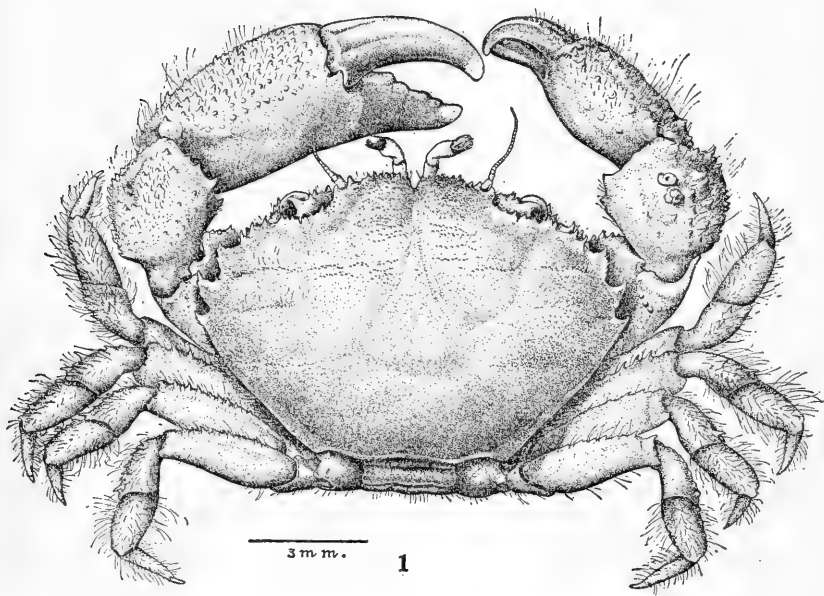
1 m. m.

4



3 m. m.

2



3 m. m.

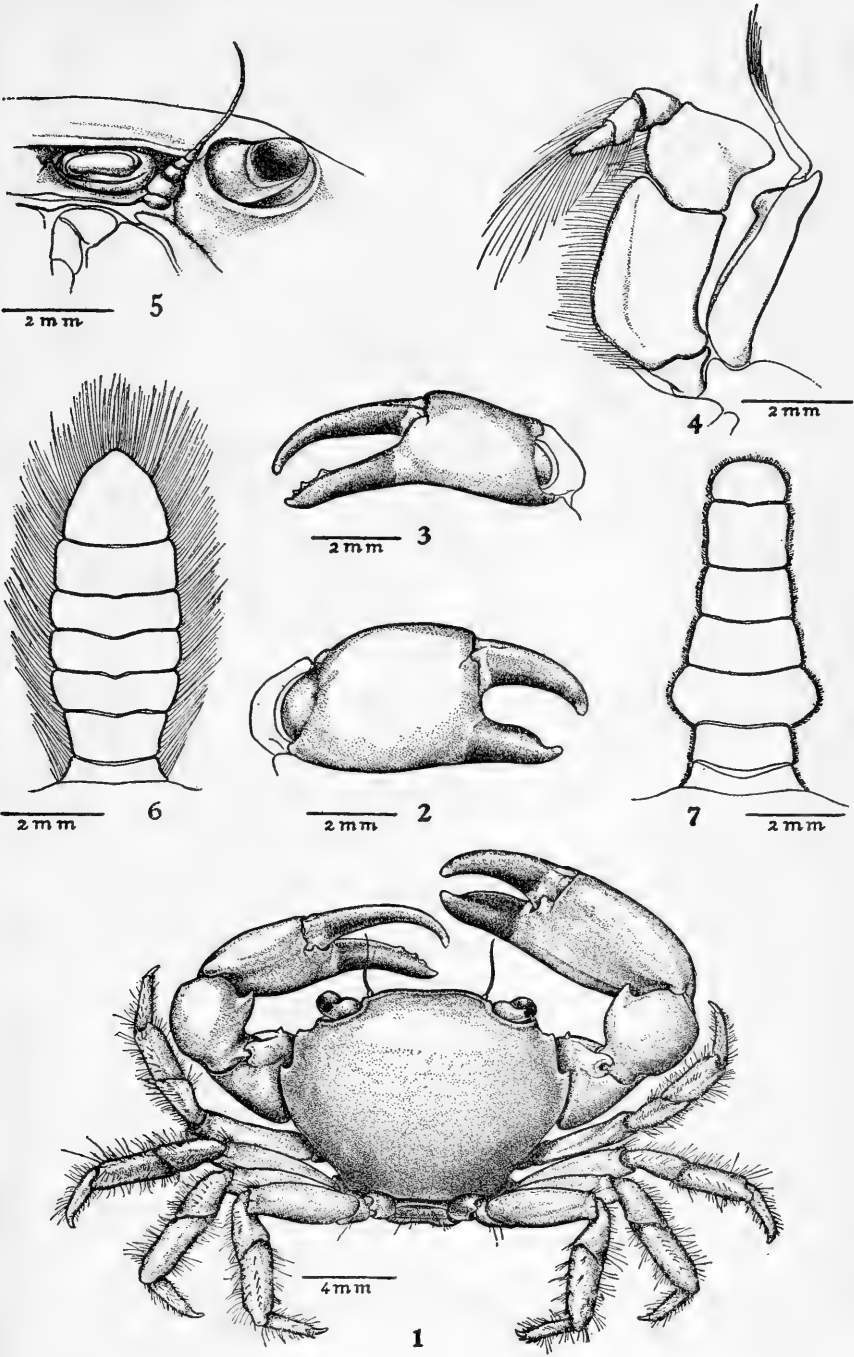
1

## PLATE 58

*Ectaeschesius bifrons* Rathbun (p. 466)

Male

- Fig. 1 Dorsal view
- Fig. 2 Right chela
- Fig. 3 Left chela
- Fig. 4 Left outer maxilliped
- Fig. 5 Antennal region
- Fig. 6 Abdomen, female
- Fig. 7 Abdomen, male

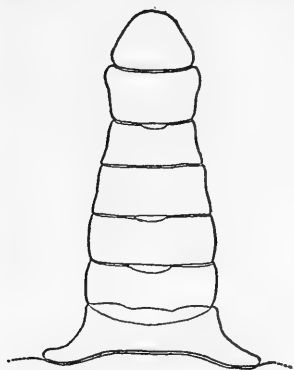


## PLATE 59

*Pilumnus xantusii* Stimpson (p. 471)

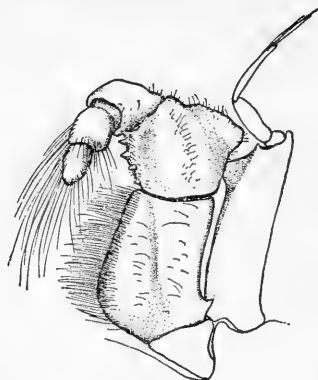
- Fig. 1 Dorsal view, female
- Fig. 2 Abdomen, male
- Fig. 3 Left outer maxilliped
- Fig. 4 Right chela, male
- Fig. 5 Right chela, female





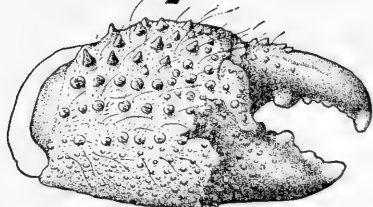
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2



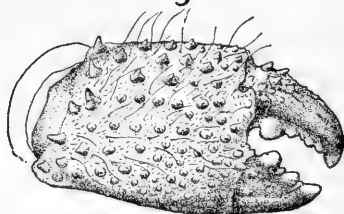
2 mm.

3



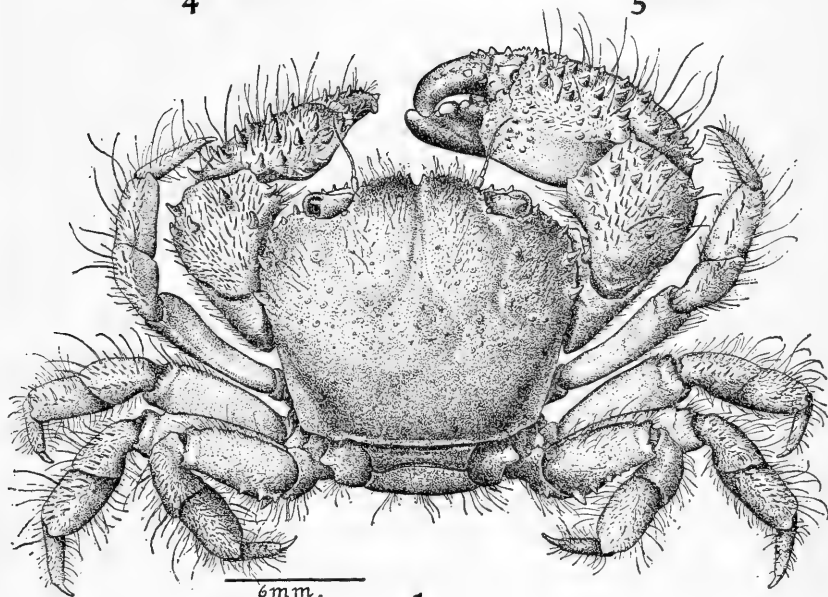
4 mm.

4



4 mm.

5

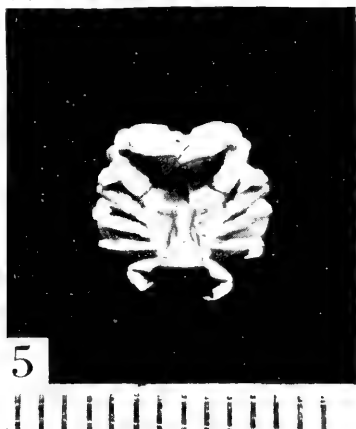
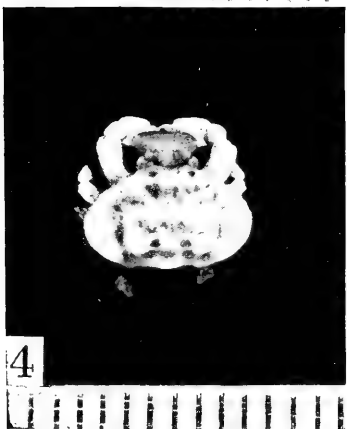
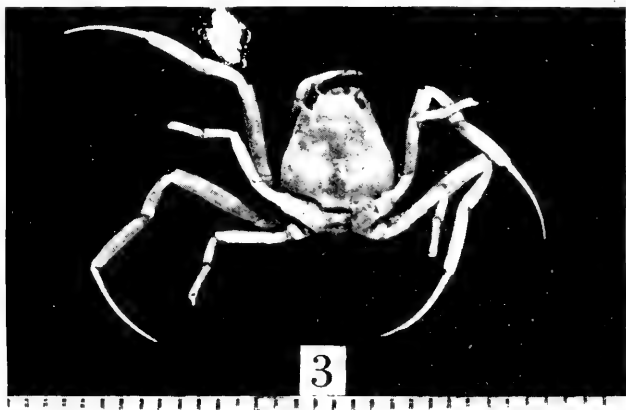
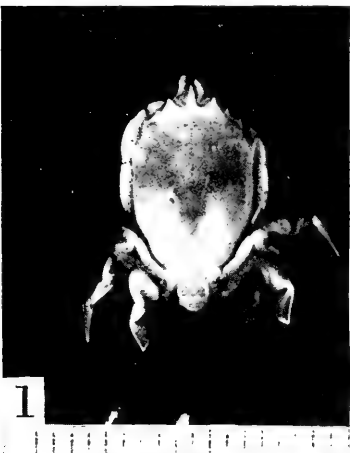


6 mm.

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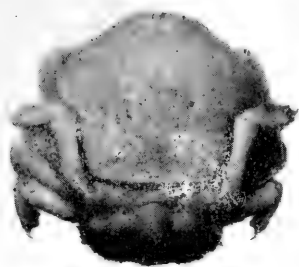
## PLATE 60

- Fig. 1 *Ranilia fornicata* (Faxon), male, dorsal view (p. 345)  
Fig. 2 *Ranilia fornicata* (Faxon), male, ventral view  
Fig. 3 *Ethusa lata* Rathbun, male, dorsal view (p. 352)  
Fig. 4 *Uhlias ellipticus* Stimpson, male, dorsal view (p. 357)  
Fig. 5 *Uhlias ellipticus* Stimpson, male, ventral view



## PLATE 61

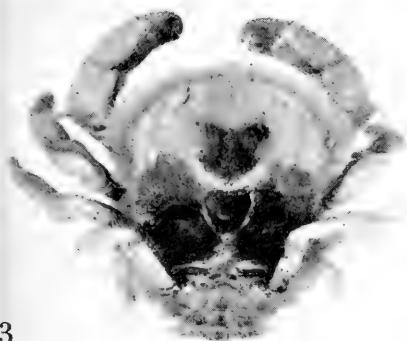
- Fig. 1 *Dromidia larraburei* Rathbun, female, dorsal view (p. 346)  
Fig. 2 *Dromidia larraburei* Rathbun, female, ventral view,  
showing sponge carried for concealment  
Fig. 3 *Hypoconcha panamensis* Smith, male, dorsal view (p. 348)  
Fig. 4 *Hypoconcha panamensis* Smith, male, ventral view  
Fig. 5 *Dynomene ursula* Stimpson, male, dorsal view (p. 349)  
Fig. 6 *Dynomene ursula* Stimpson, male, ventral view



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3



4



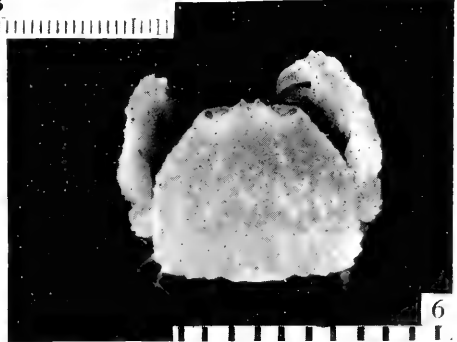
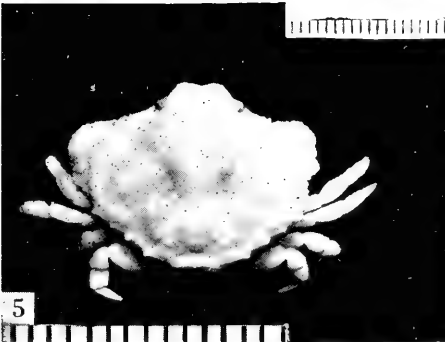
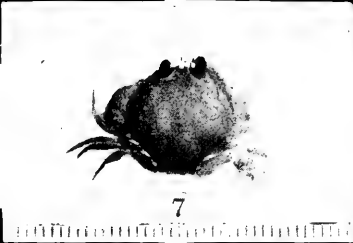
5



6

## PLATE 62

- Fig. 1 *Lithadia cumingii* Bell, male, dorsal view (p. 356)  
Fig. 2 *Randallia agaricias* Rathbun, male, dorsal view (p. 359)  
Fig. 3 *Mursia gaudichaudii* (Milne Edwards), male, dorsal view  
(p. 361)  
Fig. 4 *Mursia gaudichaudii* (Milne Edwards), male, ventral view  
Fig. 5 *Osachila levis* Rathbun, male, dorsal view (p. 365)  
Fig. 6 *Calappa convexa* Saussure, young, dorsal view (p. 360)  
Fig. 7 *Cycloës bairdii* Stimpson, male, dorsal view (p. 362)  
Fig. 8 *Cycloës bairdii* Stimpson, male, ventral view



## PLATE 63

- Fig. 1 *Stenorynchus debilis* (Smith), female, dorsal view (p. 366)  
Fig. 2 *Sphenocarcinus agassizi* Rathbun, female, dorsal view (p. 379)  
Fig. 3 *Herbstia pyriformis* (Bell), male, dorsal view (p. 383)  
Fig. 4 *Acanthonyx petiverii* Milne Edwards, male, dorsal view (p. 376)  
Fig. 5 *Microphrys aculeatus* (Bell), female, dorsal view (p. 402)  
Fig. 6 *Microphrys triangulatus* (Lockington), male, dorsal view (p. 403)





1



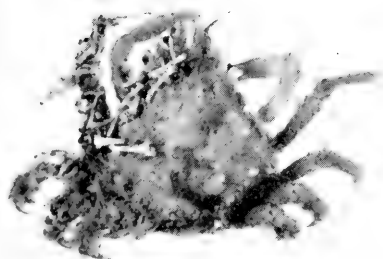
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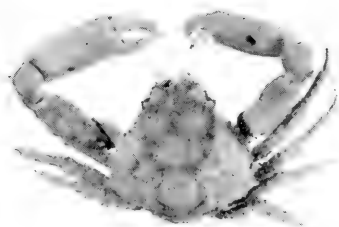
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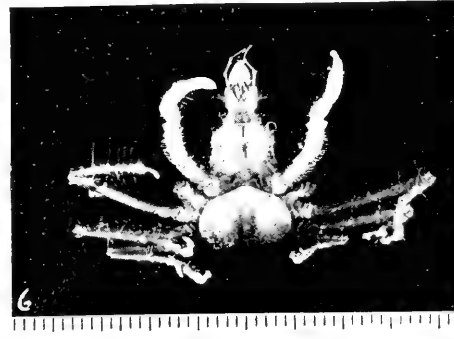
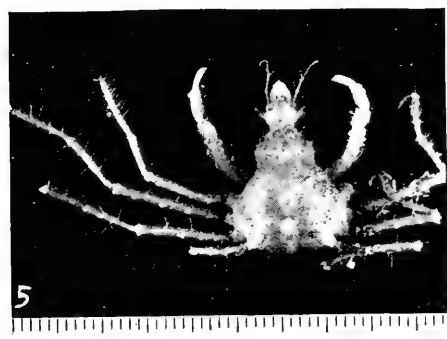
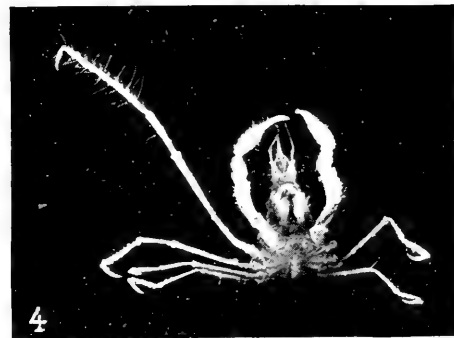
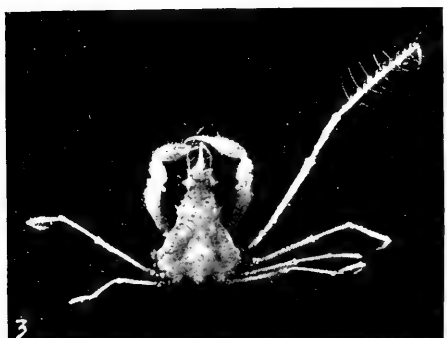
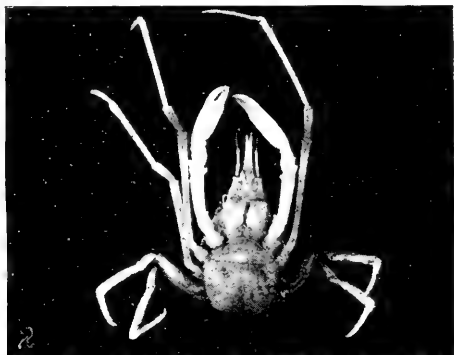
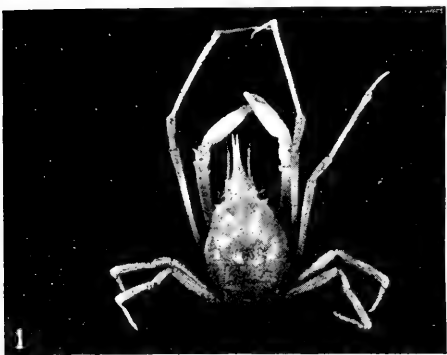
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6

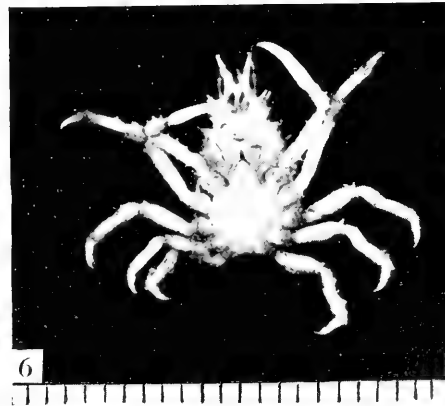
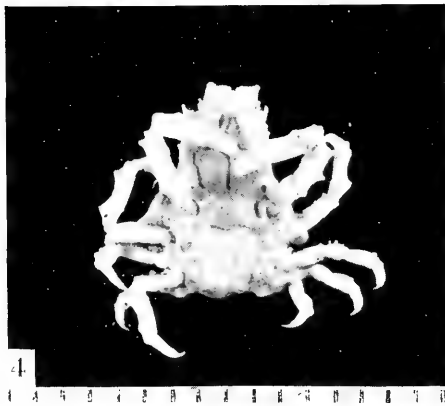
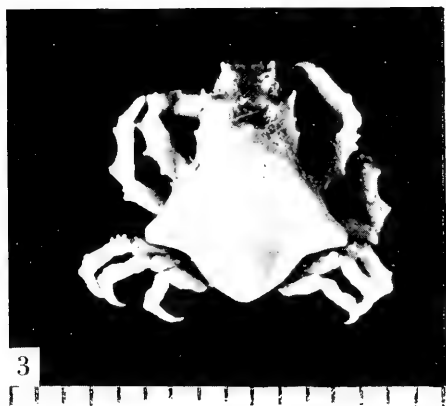
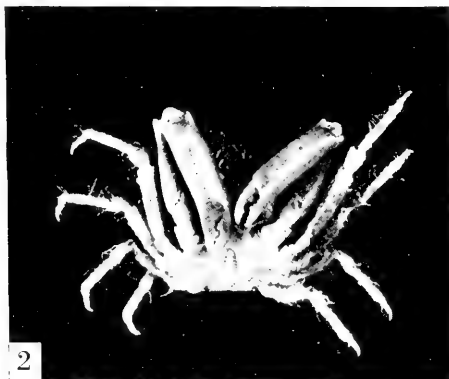
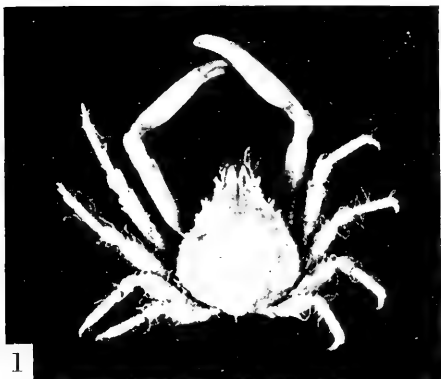
## PLATE 64

- Fig. 1 *Anamalothir hoodensis* Garth, female holotype, dorsal view (p. 368)  
Fig. 2 *Anamalothir hoodensis* Garth, female holotype, ventral view  
Fig. 3 *Podochela schmitti* Garth, male holotype, dorsal view (p. 371)  
Fig. 4 *Podochela schmitti* Garth, male holotype, ventral view  
Fig. 5 *Podochela margaritaria* Rathbun, female, dorsal view (p. 369)  
Fig. 6 *Podochela margaritaria* Rathbun, female, ventral view



## PLATE 65

- Fig. 1 *Herbstia edwardsii* Bell, male, dorsal view (p. 381)  
Fig. 2 *Herbstia edwardsii* Bell, male, ventral view  
Fig. 3 *Lissa aurivilliusi* Rathbun, female, dorsal view (p. 384)  
Fig. 4 *Lissa aurivilliusi* Rathbun, female, ventral view  
Fig. 5 *Mithrax (Mithrax) spinipes* (Bell), male, dorsal view (p. 388)  
Fig. 6 *Mithrax (Mithrax) spinipes* (Bell), male, ventral view



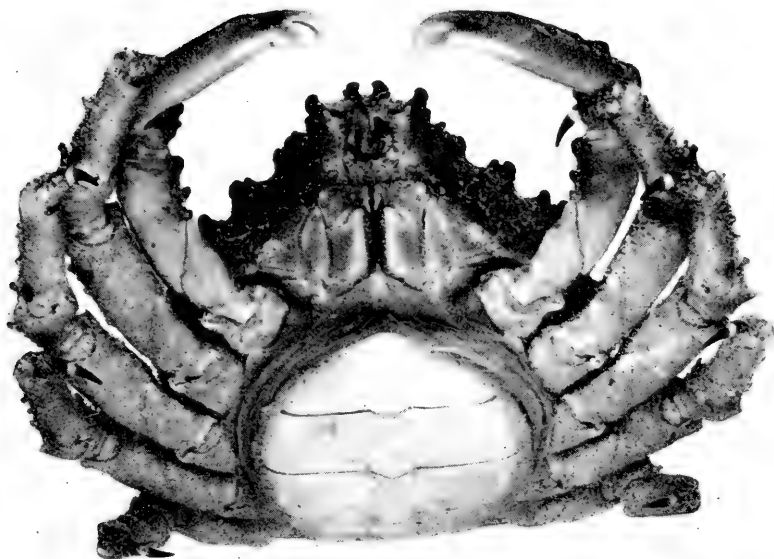
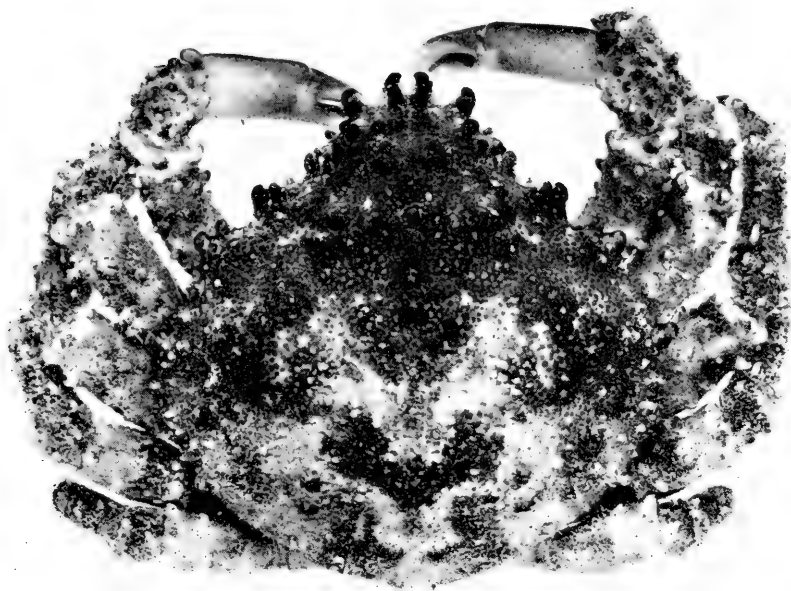
## PLATE 66

*Mithrax (Mithrax) bellii* Gerstaecker (p. 389)

Female

Fig. 1 Dorsal view, x 1.25

Fig. 2 Ventral view, x 1.25



## PLATE 67

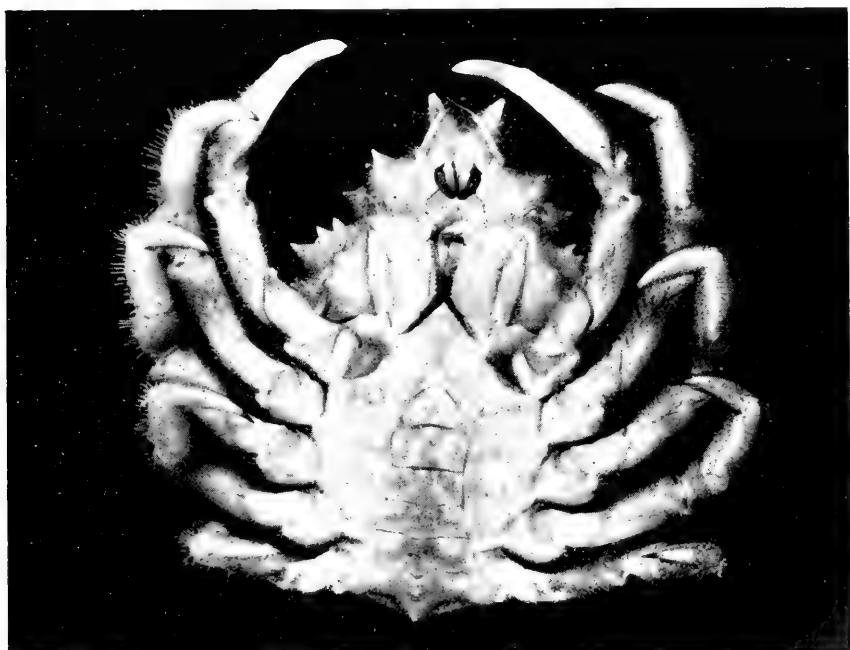
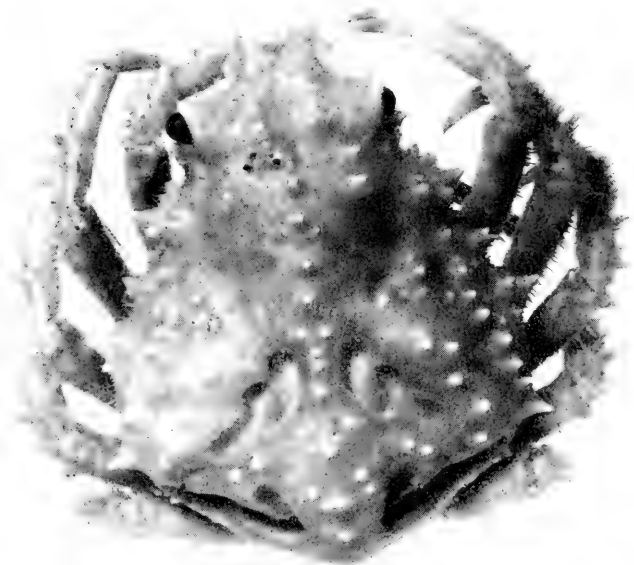
*Stenocionops triangulata* (Rathbun) (?) (p. 401)

Male

Fig. 1 Dorsal view, x 1.8

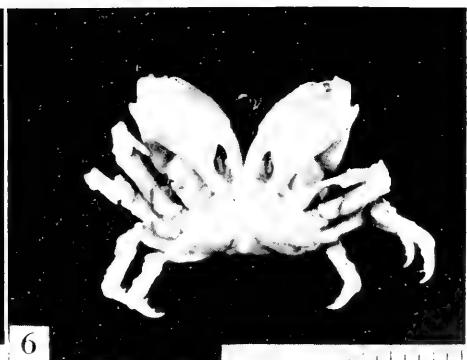
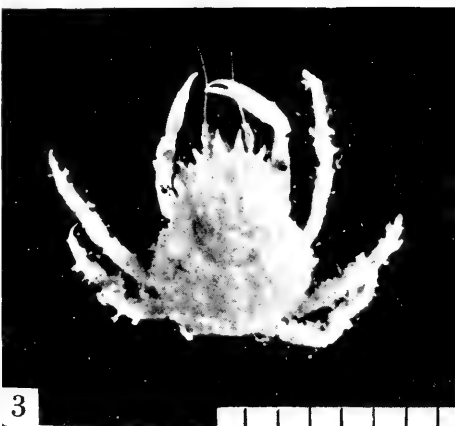
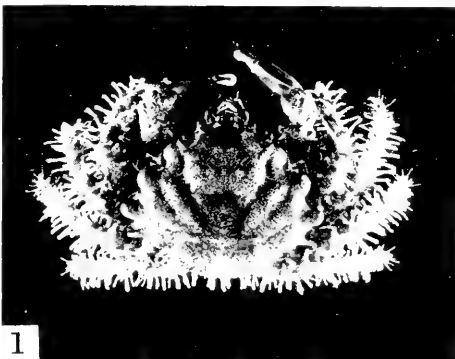
Fig. 2 Ventral view, x 1.8





## PLATE 68

- Fig. 1 *Mithrax (Mithraculus) nodosus* Bell, young, dorsal view (p. 392)  
Fig. 2 *Stenocionops triangulata*, (Rathbun), young male, dorsal view  
(p. 401)  
Fig. 3 *Microphrys platysoma* (Stimpson), young female, dorsal view (p. 405)  
Fig. 4 *Microphrys platysoma* (Stimpson), young female, ventral view  
Fig. 5 *Teleophrys cristulipes* Stimpson, male, dorsal view (p. 396)  
Fig. 6 *Teleophrys cristulipes* Stimpson, male, ventral view



## PLATE 69

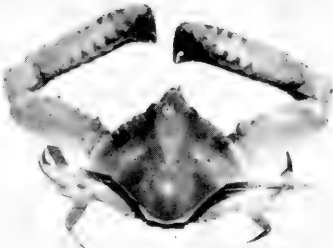
- Fig. 1 *Parthenope (Pseudolambrus) triangula* (Stimpson),  
male, dorsal view (p. 410)
- Fig. 2 *Parthenope (Platylambrus) exilipes* (Rathbun),  
female, dorsal view (p. 409)
- Fig. 3 *Solenolambrus arcuatus* Stimpson, male, dorsal view (p. 413)
- Fig. 4 *Solenolambrus arcuatus* Stimpson, male, ventral view
- Fig. 5 *Mesorhoea bellii* (A. Milne Edwards), male, dorsal view (p. 414)
- Fig. 6 *Mesorhoea bellii* (A. Milne Edwards), male, ventral view



1



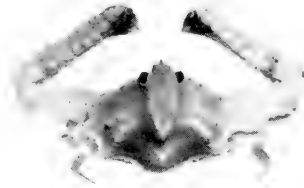
2



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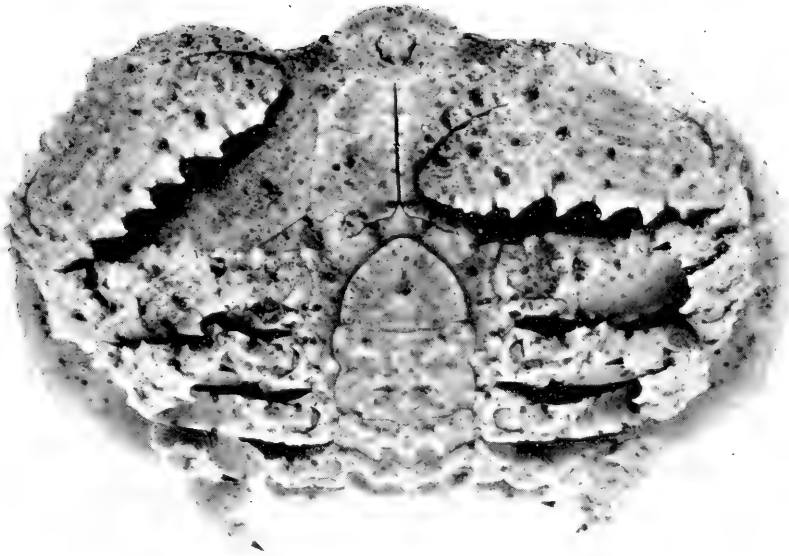
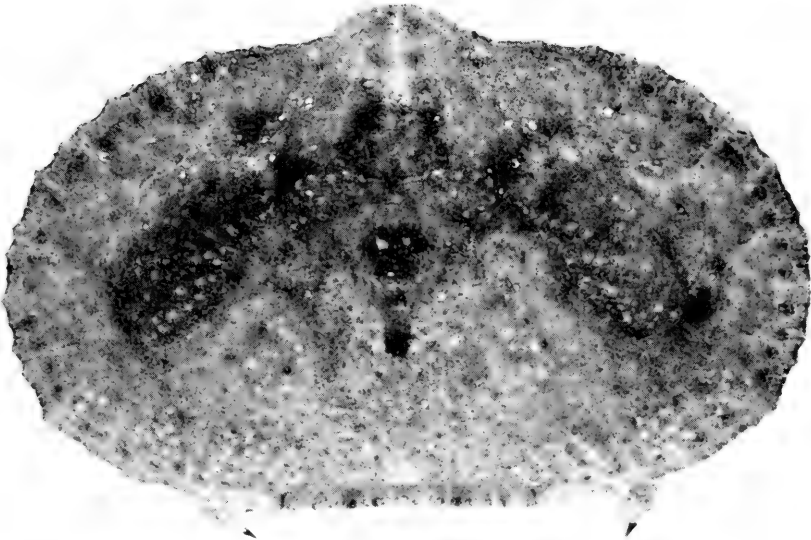
## PLATE 70

*Aethra scruposa scutata* Smith (p. 415)

Female

Fig. 1 Dorsal view, x 1.27

Fig. 2 Ventral view, x 1.27



## PLATE 71

- Fig. 1 *Portunus (Achelous) stanfordi* Rathbun, male, dorsal view (p. 416)
- Fig. 2 *Portunus (Achelous) tuberculatus* (Stimpson), female, dorsal view (p. 421)
- Fig. 3 *Portunus (Achelous) angustus* Rathbun, ovigerous female, dorsal view (p. 419)
- Fig. 4 *Portunus (Achelous) angustus* Rathbun, ovigerous female, ventral view





2



4



1



3

## PLATE 72

- Fig. 1 *Euphylax dovii* Stimpson, male, dorsal view (p. 423)  
Fig. 2 *Euphylax dovii* Stimpson, male, ventral view  
Fig. 3 *Cronius ruber* (Lamarck), male, dorsal view (p. 422)  
Fig. 4 *Cronius ruber* (Lamarck), male, ventral view



2



4



1



3

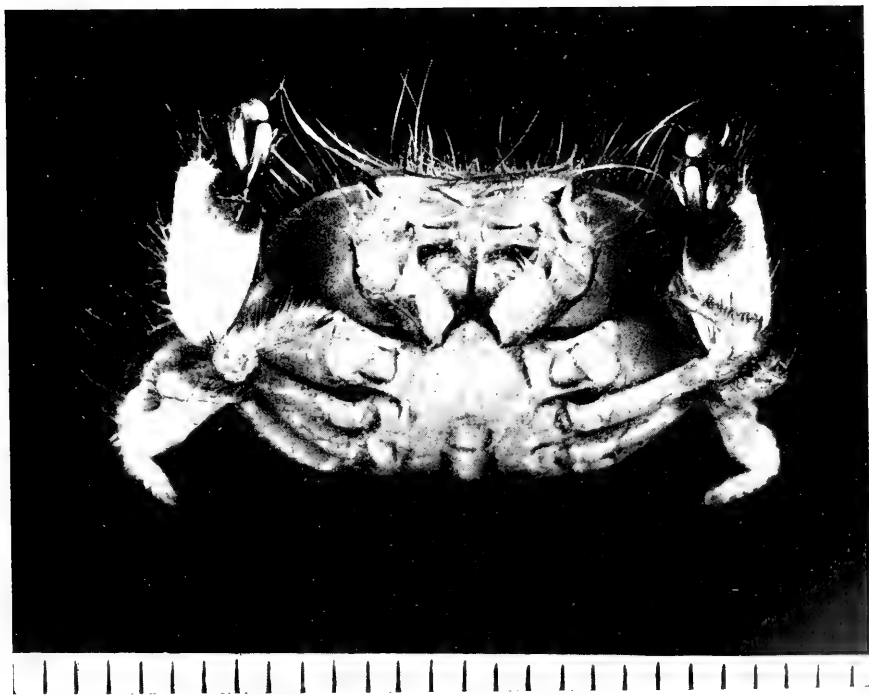
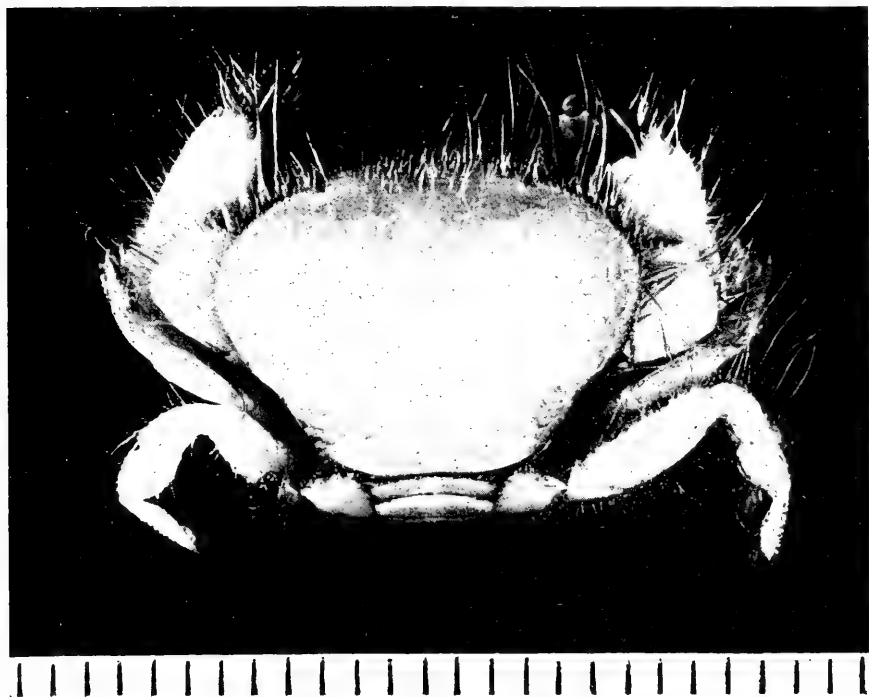
## PLATE 73

*Kraussia americana* Garth (p. 424)

Male holotype

Fig. 1 Dorsal view

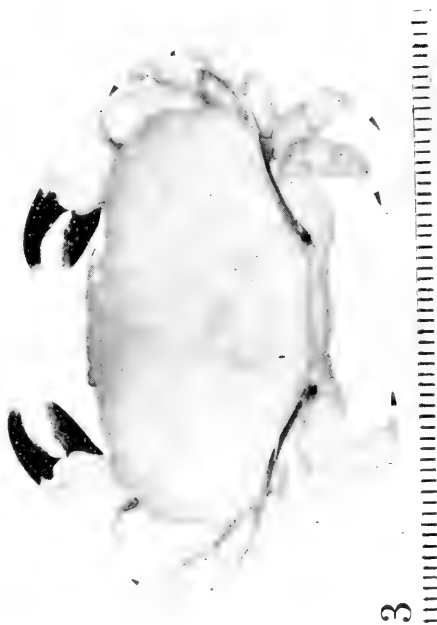
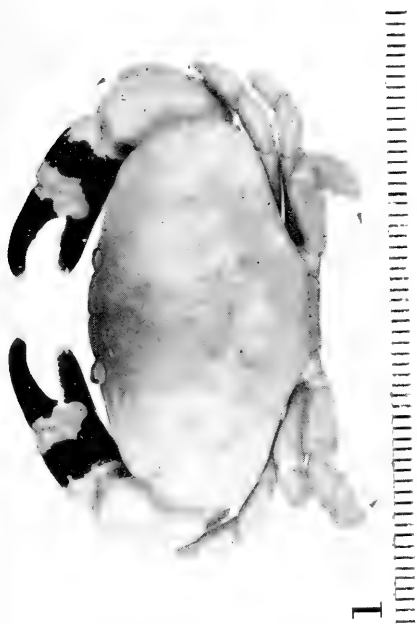
Fig. 2 Ventral view



## PLATE 74

*Carpilodes cinctimanus* (White) (p. 426)

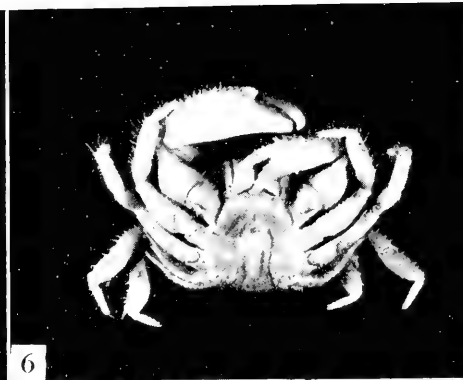
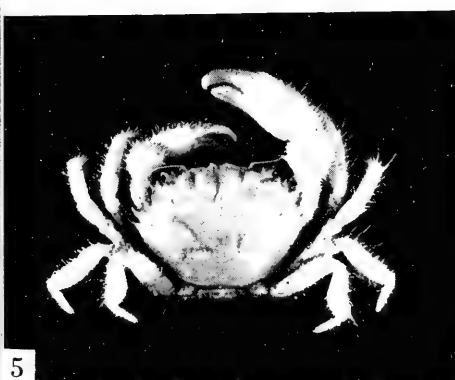
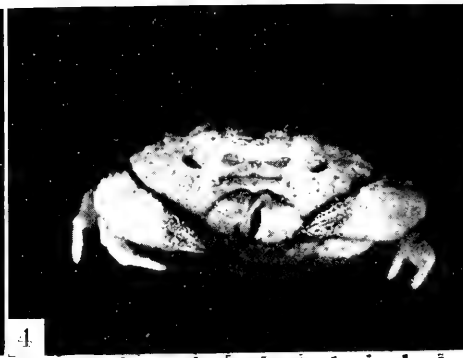
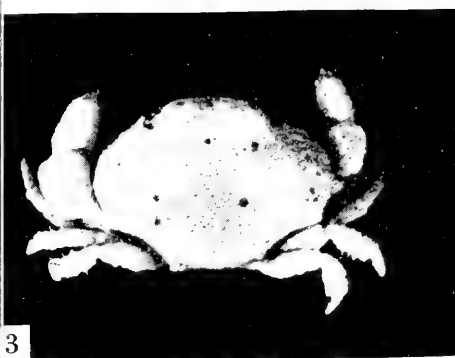
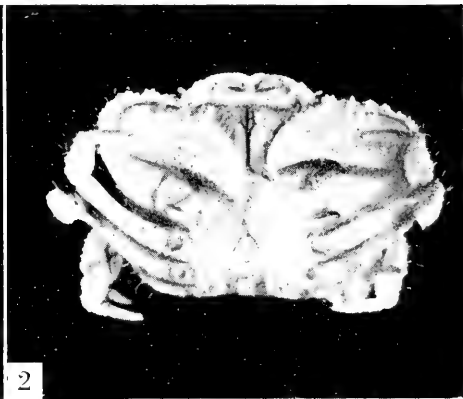
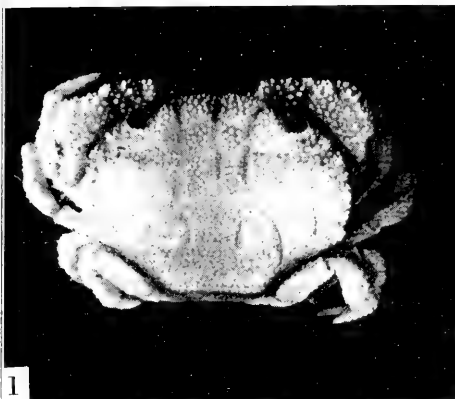
- Fig. 1 Male, dorsal view
- Fig. 2 Male, ventral view
- Fig. 3 Female, dorsal view
- Fig. 4 Female, ventral view



## PLATE 75

- Fig. 1 *Actaea angusta* Rathbun, male, dorsal view (p. 433)  
Fig. 2 *Actaea angusta* Rathbun, male, ventral view  
Fig. 3 *Lipacesthesius lecanus* Rathbun, female, dorsal view (p. 441)  
Fig. 4 *Lipacesthesius lecanus* Rathbun, female, frontal view  
Fig. 5 *Medaeus spinulifer* (Rathbun), male, dorsal view (p. 443)  
Fig. 6 *Medaeus spinulifer* (Rathbun), male, ventral view





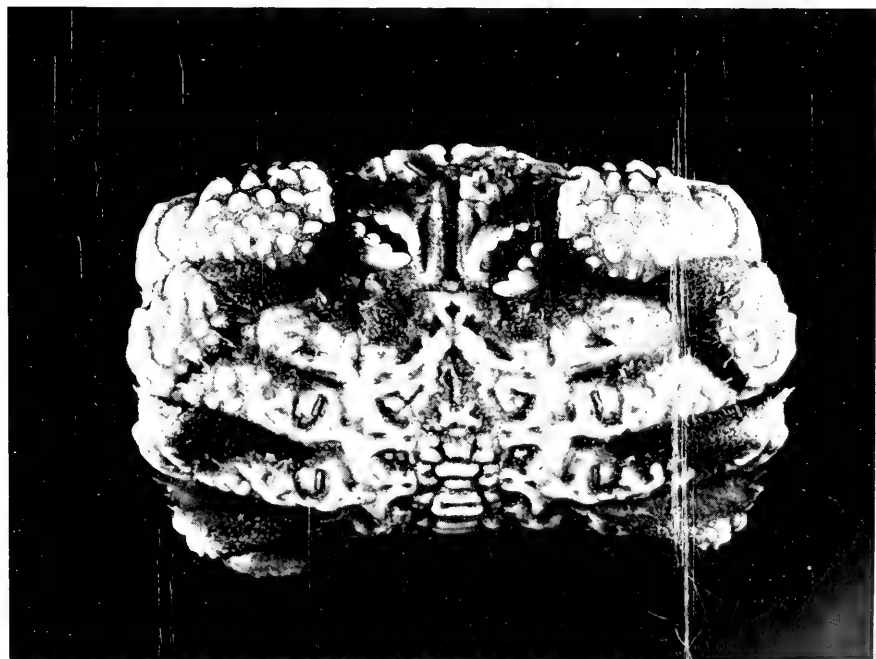
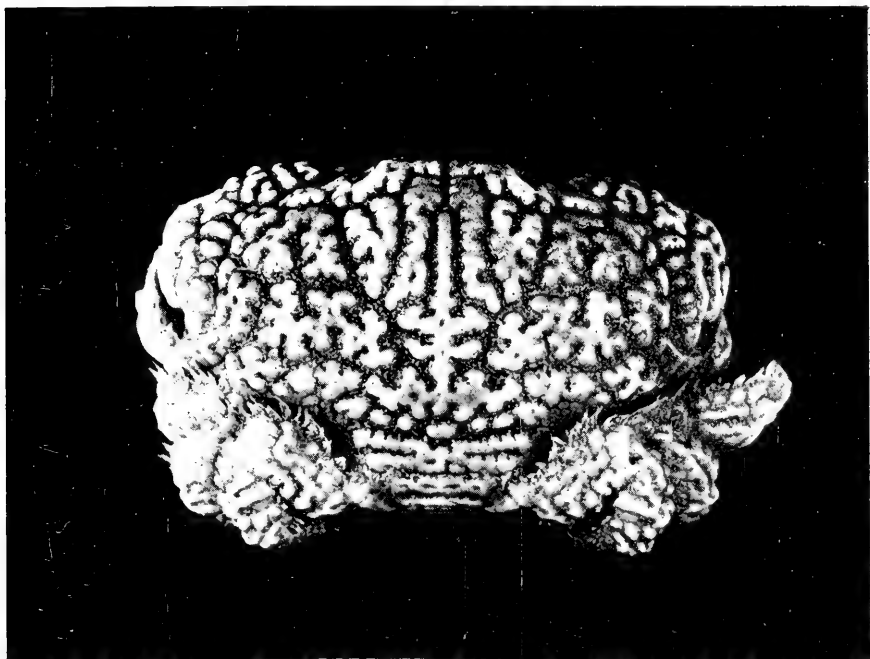
## PLATE 76

*Glyptoxanthus hancocki* Garth (p. 437)

Female holotype

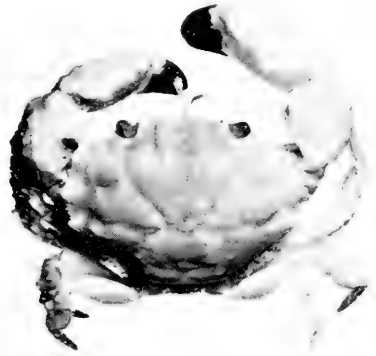
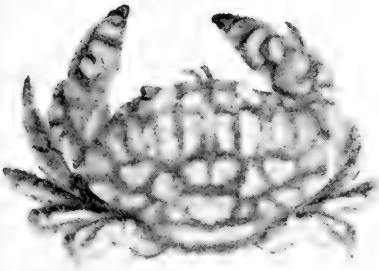
Fig. 1 Dorsal view

Fig. 2 Ventral view



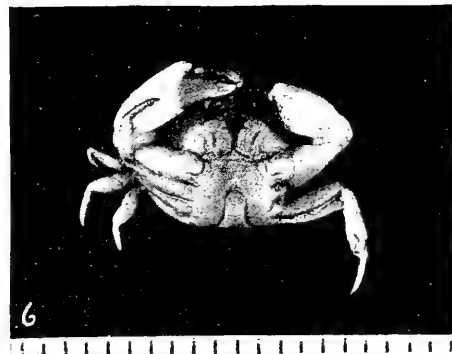
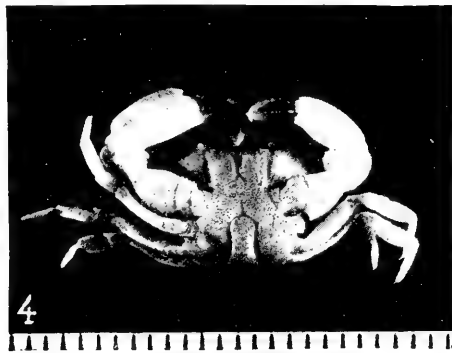
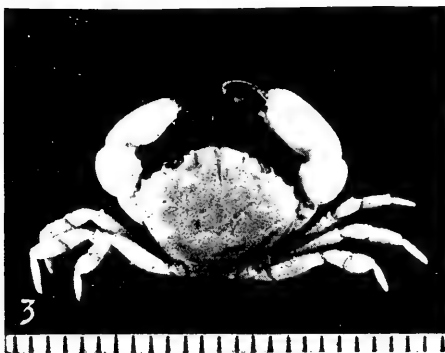
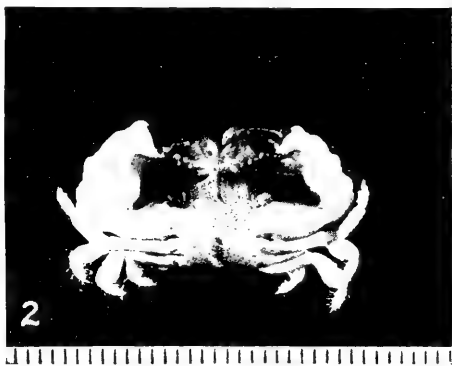
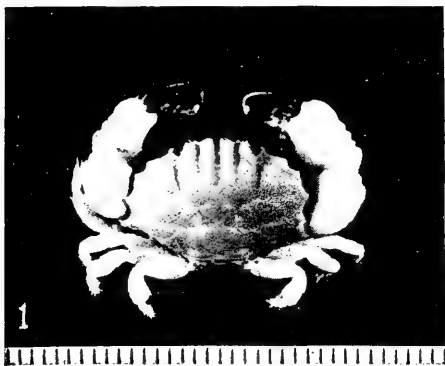
## PLATE 77

- Fig. 1 *Actaea sulcata* Stimpson, male, dorsal view (p. 434)  
Fig. 2 *Medaeus lobipes* Rathbun, male, dorsal view (p. 442)  
Fig. 3 *Leptodius cooksoni* Miers, male, dorsal view (p. 448)  
Fig. 4 *Micropanope polita* Rathbun, male, dorsal view (p. 459)  
Fig. 5 *Lophoxanthus lamellipes* (Stimpson), male, dorsal view (p. 451)  
Fig. 6 *Micropanope xantusii* (Stimpson), male, dorsal view (p. 457)



## PLATE 78

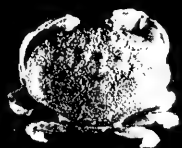
- Fig. 1 *Paraxanthias insculptus* (Stimpson), male, dorsal view (p. 467)  
Fig. 2 *Paraxanthias insculptus* (Stimpson), male, ventral view  
Fig. 3 *Lophopanopeus maculatus* Rathbun, male, dorsal view (p. 453)  
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Fig. 5 *Hexapanopeus cartagoensis* Garth, male holotype, dorsal view (p. 454)  
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## PLATE 79

- Fig. 1 *Platypodia gemmata* Rathbun (p. 428)  
Fig. 2 *Actaea dovii* Stimpson, young (p. 431)  
Fig. 3 *Leptodius cooksoni* Miers (p. 448)  
Fig. 4 *Pilumnus xantusii* Stimpson (p. 471)  
Fig. 5 *Cycloxanthops vittatus* (Stimpson) (p. 445)  
Fig. 6 *Actaea dovii* Stimpson, adult (p. 431)





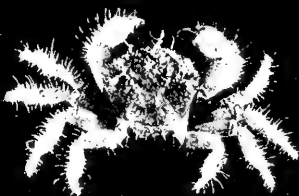
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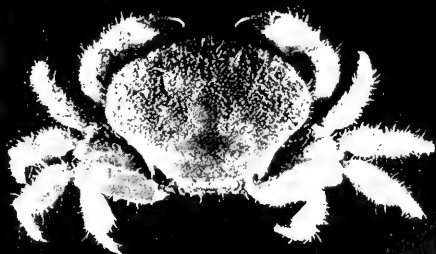
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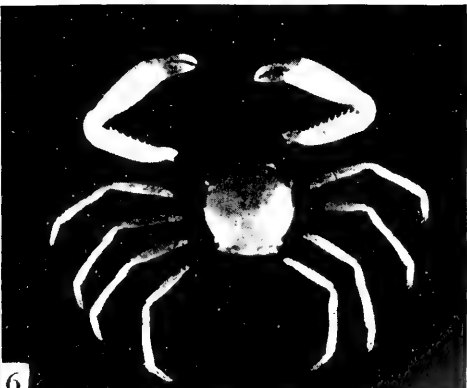
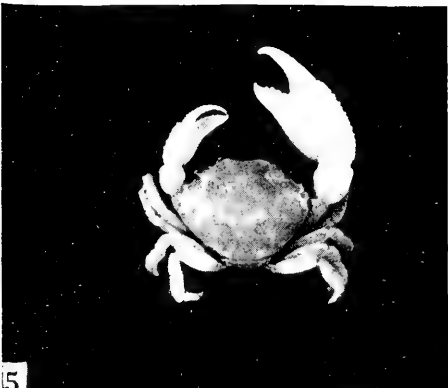
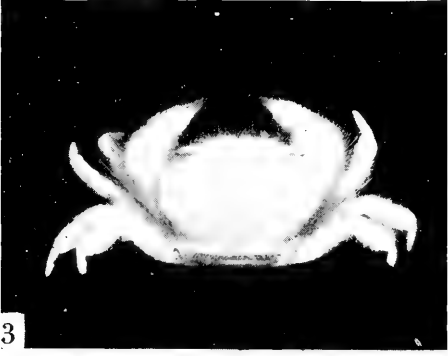
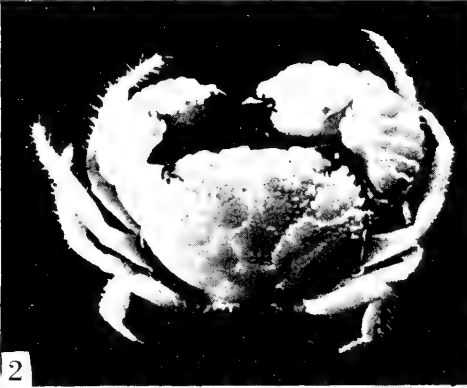
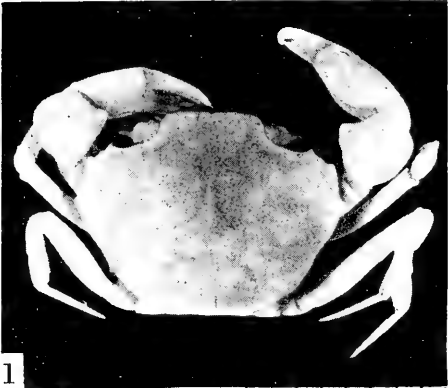
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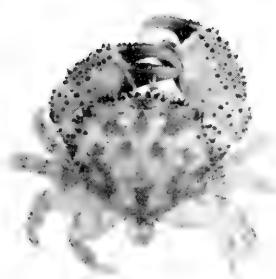
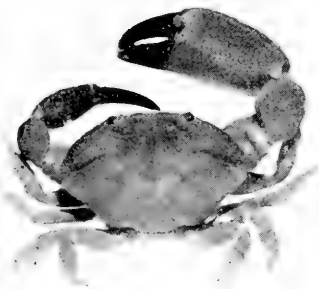
## PLATE 80

- Fig. 1 *Tetraxanthus rathbunae* Chace, young female, dorsal view (p. 465)
- Fig. 2 *Eriphia granulosa* A. Milne Edwards, male, dorsal view (p. 483)
- Fig. 3 *Acidops fimbriatus* Stimpson, male, dorsal view (p. 474)
- Fig. 4 *Pilumnus pygmaeus* Boone, male, dorsal view (p. 472)
- Fig. 5 *Maldivia galapagensis* Garth, male holotype, dorsal view (p. 495)
- Fig. 6 *Quadrella nitida* Smith, young, dorsal view (p. 494)



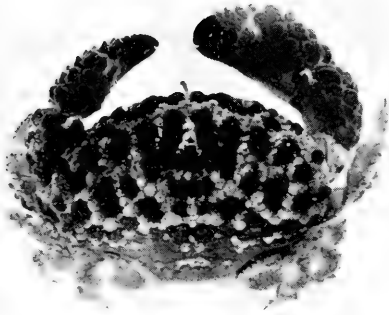
## PLATE 81

- Fig. 1 *Ozius tenuidactylus* (Lockington), male, dorsal view  
(p. 479)
- Fig. 2 *Ozius perlatus* Stimpson, male, dorsal view (p. 477)
- Fig. 3 *Ozius verreauxii* Saussure, young, dorsal view (p. 476)
- Fig. 4 *Trapezia cymodoce ferruginea* Latreille, male, dorsal view  
(p. 491)
- Fig. 5 *Domecia hispida* Eydoux and Souleyet, male, dorsal view  
(p. 489)
- Fig. 6 *Trapezia digitalis* Latreille, female, dorsal view (p. 493)



## PLATE 82

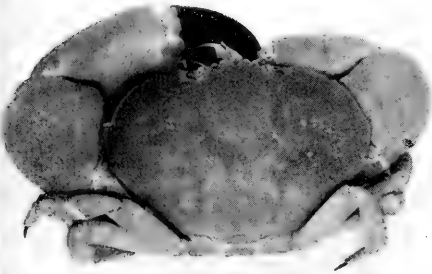
- Fig. 1 *Daira americana* Stimpson, female, dorsal view (p. 438)  
Fig. 2 *Daira americana* Stimpson, female, ventral view  
Fig. 3 *Menippe obtusa* Stimpson, male, dorsal view (p. 470)  
Fig. 4 *Menippe obtusa* Stimpson, male, ventral view  
Fig. 5 *Ozius verreauxii* Saussure, male, dorsal view (p. 476)  
Fig. 6 *Ozius verreauxii* Saussure, male, ventral view



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## PLATE 83

- Fig. 1 *Leptodius snodgrassi* Rathbun, male, dorsal view (p. 447)  
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Fig. 5 *Eriphia squamata* Stimpson, male, dorsal view (p. 482)  
Fig. 6 *Eriphia squamata* Stimpson, male, ventral view





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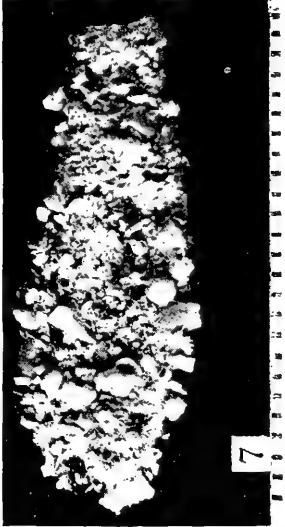


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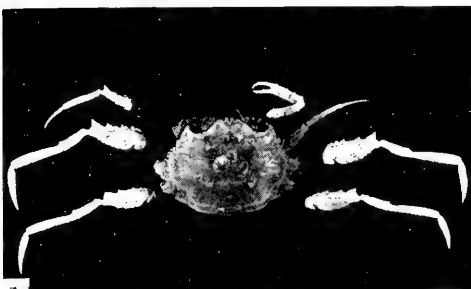
## PLATE 84

- Fig. 1 *Parapinnixa glasselli* Garth, female paratype, dorsal view (p. 497)
- Fig. 2 *Parapinnixa glasselli* Garth, female paratype, ventral view
- Fig. 3 *Pinnaxodes chilensis* (Milne Edwards), female, dorsal view (p. 498)
- Fig. 4 *Stronglylocentrotus gibbosus* (Valenciennes)  
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- Fig. 5 *Pinnaxodes chilensis* (Milne Edwards), female,  
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- Fig. 6 *Pinnixa transversalis* (Milne Edwards and Lucas), female,  
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host of *Pinnixa transversalis* (p. 497)
- Fig. 8 *Pinnixa transversalis* (Milne Edwards and Lucas), female,  
ventral view (p. 497)



## PLATE 85

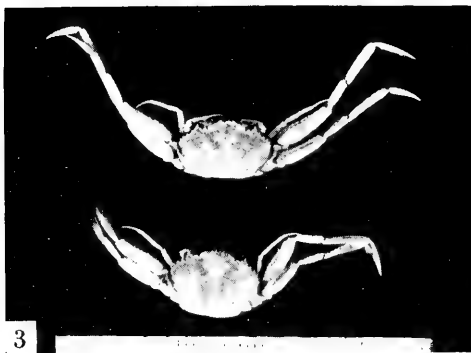
- Fig. 1 *Cymopolia velerae* Garth, female holotype, dorsal view (p. 503)
- Fig. 2 *Cymopolia cortezi* Crane, young, dorsal view (p. 499)
- Fig. 3 *Cymopolia fragilis* Rathbun, dorsal view, male above, female below (p. 501)
- Fig. 4 *Cymopolia fragilis* Rathbun, ventral view, male above, female below
- Fig. 5 *Euchirograpsus americanus* A. Milne Edwards, male, dorsal view (p. 511)
- Fig. 6 *Euchirograpsus americanus* A. Milne Edwards, male, ventral view



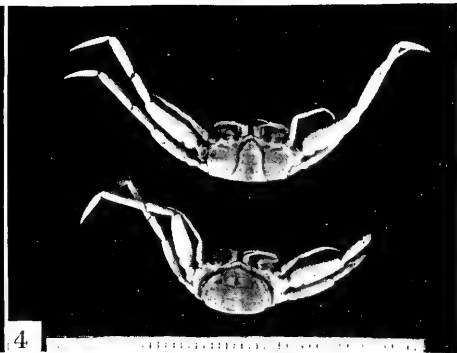
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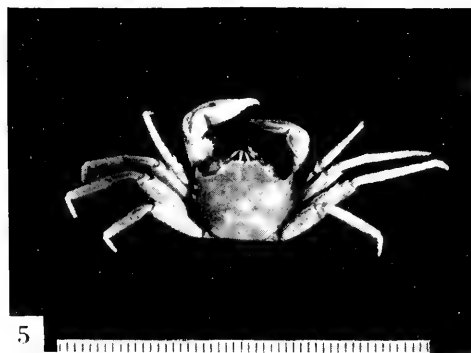
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## PLATE 86

- Fig. 1 *Grapsus grapsus* (Linnaeus), male, dorsal view (p. 504)  
Fig. 2 *Grapsus grapsus* (Linnaeus), male, ventral view  
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Fig. 5 *Percnon gibbesi* (Milne Edwards), female, dorsal view  
(p. 512)  
Fig. 6 *Percnon gibbesi* (Milne Edwards), female, ventral view



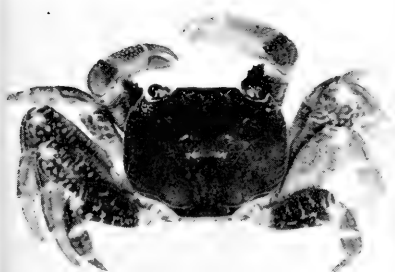
1

*Grapsus*



2

*Grapsus*



3

*Grapsus*



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*Grapsus*



5

*Grapsus*



6

*Grapsus*

## PLATE 87

- Fig. 1 *Cymopolia lucasii* (Rathbun), male, dorsal view (p. 500)  
Fig. 2 *Pachygrapsus transversus* (Gibbes), male, dorsal view (p. 507)  
Fig. 3 *Uca galapagensis* Rathbun, male, dorsal view (p. 515)  
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Fig. 6 *Uca helleri* Rathbun, female, dorsal view  
Fig. 7 *Ocypode gaudichaudii*, Milne Edwards and Lucas, male,  
dorsal view, natural size (p. 514)





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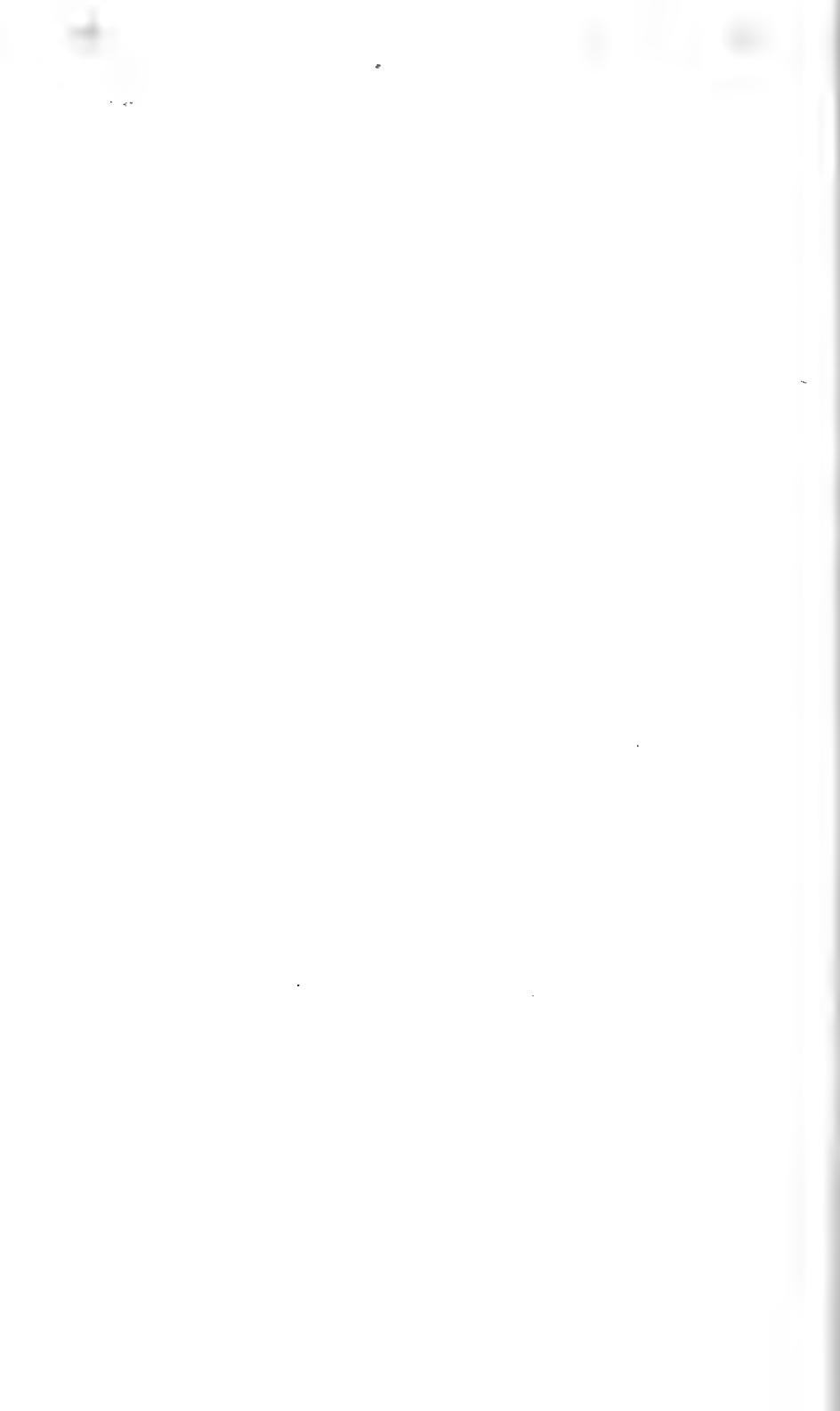
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REPORTS ON THE COLLECTIONS OBTAINED BY ALLAN HANCOCK PACIFIC EXPEDITIONS OF  
VELERO III OFF THE COAST OF MEXICO, CENTRAL AMERICA, SOUTH AMERICA,  
AND GALAPAGOS ISLANDS IN 1932, IN 1933, IN 1934, IN 1935,  
IN 1936, IN 1937, IN 1938, IN 1939, IN 1940, AND IN 1941.

DISTRIBUTION STUDIES  
OF GALAPAGOS BRACHYURA  
(CHARTS 1-10)

*By* JOHN S. GARTH

THE UNIVERSITY OF SOUTHERN CALIFORNIA PUBLICATIONS  
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# DISTRIBUTION STUDIES OF GALAPAGOS BRACHYURA

(CHARTS 1-10)

By JOHN S. GARTH

## PRELIMINARY STATEMENT

The Galapagos littoral is now credited with supporting some 120 brachyuran species, 47 of these by virtue of intensive carcinological collecting carried on by Allan Hancock Expeditions in the years 1933-35 and 1938 (cf. Sivertsen, 1933). In the course of routine taxonomic studies on Hancock collections which culminated in the writing of the *Littoral Brachyuran Fauna of the Galapagos Archipelago* (Garth, 1946), 15 species were described as new to science (Rathbun, 1933, 1935; Garth, 1939; and Glassell, 1940). Several of these were noted as having close trans-Pacific affinities, while the remaining 32 new to the islands represented extensions of range of known species from the North and South American mainland.

Many species known previously to occur at one or two localities within the islands were found to occur at most of the eleven major and numerous minor islands which comprise the Galapagos group. Others were noticeably absent over large areas in which their existence might reasonably have been expected. These new data appeared to furnish the basis for an analysis of the distribution of species and genera with a view of ascertaining the possible routes by which they arrived in and were distributed through the archipelago.

## INTRA-INSULAR DISTRIBUTION

(CHARTS I-III)

The first step in the study was to plot on charts of the Galapagos Islands the stations at which individual species were encountered by Allan Hancock Expeditions. These charts, too numerous for reproduction herewith, are available at the Library of The University of Southern California, where they form a part of the writer's doctoral dissertation. From them it was apparent that the large majority of species were more or less uniformly distributed throughout the length and breadth of the archipelago. When the relationships of these species were examined, they were found to be either endemic species, or if non-endemic, species common to tropical faunas: the Caribbean, the Panamic, and the Indo-Pacific. Two

small but important groups of species remained, the one clearly restricted to the northern and northwesterly islands, the other equally limited to the southern and southeasterly islands. Since these minority groups seemed to offer a clue to routes of arrival and dispersal, it was upon them that attention was particularly concentrated.

Species found only at the extreme northerly islands were *Cymopolia fragilis* and *C. cortezi*, dredged in 100-150 fathoms at Wenman, *Microphrys platysoma*, dredged in 40-70 fathoms at Tower, and *Pilumnus xantusii*, cracked from *Pocillopora* coral at Tower, Albemarle (Albemarle Point and Tagus Cove), and James (Sullivan Bay). These species also occur in the Gulf of California, some 2,000 miles to the northward. Another Gulf of California species, *Eurytium affine*, was collected on the north shore of Indefatigable at Conway Bay. This distribution is shown on Chart I. If these species had been successful in extending their range southward, it was felt that they would in all probability have been taken at one or more of the numerous *Velero III* stations in the southern half of the island group.

Species found only at the extreme southeasterly islands were *Eupleurodon rathbunae*, washed from sargassum at Hood and Charles, and *Microphrys aculeatus*, collected on the shores of Hood and Charles and along the south and east shores of Indefatigable to South Seymour and again at Tagus Cove, Albemarle, a distribution shown on Chart II. The latter is a Peruvian species, the former very similar to, if not identical with, *Epialtus peruvianus* (not *Eupleurodon peruvianus*), which should be transferred to *Eupleurodon* and given another specific name. It was likewise apparent that if these species had been successful in extending their ranges northward they would almost certainly have been collected at one or more of the numerous shore stations in the northern portion of the archipelago. There must be, therefore, some natural obstacle to the free migration of these species from north to south and vice versa, once they have gained foothold at either extremity of the island group.

It will be seen by an examination of Chart III that the Galapagos Islands are disposed in such a way that the primary channels, those passing from one extreme of the archipelago to the other, are from southeast to northwest. One of these runs on either side of Albemarle, the third between Hood and Chatham, with Barrington, Indefatigable, and James on the west and Chatham, Tower, Bindloe, and Abingdon on the east. An important secondary channel, intersecting at right angles, divides the eastern half of the archipelago north of Indefatigable. It is quite possible that bodies of water of unlike temperatures, salinities, and oxygen contents

may be moving at differing rates of speed and in opposing directions in these channels simultaneously. It is further probable that water flowing through these channels may undergo a seasonal reversal of direction in response to movements of large water masses in the greater Pacific area. However, since each of the five Allan Hancock Expeditions to the Galapagos was made in the months of December, January, and February, observations of conditions during these months only can be given.

As shown by the accompanying Chart III, a body of warm water, A, flowing southeastward between northern Albemarle and James Islands, meets a current of cold water, B, flowing northwest between southern Albemarle and Indefatigable Islands, and is deflected to the east off Jervis and Duncan Island, E, along the north shore of Indefatigable Island, to join the warm water streaming down the east side of James Island, which has met cold current C somewhere between James and Tower Islands, as at F. Observations in this connection are (1) the drifting of the expedition cruiser *Velero III* in a current too strong to permit anchoring, along the north shore of Duncan Island in the direction of Indefatigable, (2) the conflict of two currents coming from the south around each side of Charles Island while dredging was being attempted at G, (3) the casting of the survivors of the sloop *Dinamita*, becalmed while crossing from Indefatigable to Chatham Island, upon Bindloe Island, nearly 100 miles northwestward, and (4) the driving of an Ecuadorean fishing vessel out of Academy Bay towards the Gordon Rocks, opposite C.

Evidence of a difference of as much as 20° F. in surface temperature between the cooler current coming from the southeast and warmer current from the northwest was obtained in January, 1932, when 66° F. was recorded on the west side of Albemarle Island and 86° F. on the east, the former corresponding to surface temperatures of Coastal Peru, the latter to that of Cocos Island, in the Bay of Panama. At the northern tip of Albemarle, where these currents met at D, an extensive current rip was noted in December, 1934. At Tagus Cove that year overcoats were worn for comfort, while at Cartago Bay, on the eastern side of the Island, summer clothing was in order. Galapagos penguins were seen at both Tagus Cove and Duncan Island, while at Cartago Bay the manta ray (*Manta birostris*) and the sea snake (*Pelamis platurus*), both characteristic of warm tropical seas, were observed.

Taking Hood Island as a hypothetical starting point, a scheme of water circulation based upon the observations just given would account for the present known distribution of Peruvian species in the Galapagos Islands.

It would explain the occurrence of *Microphrys aculeatus* at such localities as Tagus Cove, Academy Bay, and South Seymour Island, since all are within the zone of influence of cold current B. Likewise, taking Wenman Island as a starting point, such a scheme would account for the present known distribution of most Gulf of California species in the Galapagos Islands. It would explain the occurrence of *Pilumnus xantusii* at Albemarle Point and James Island, and of *Eurytium affine* at Conway Bay, north shore of Indefatigable Island, since these are within the zone of influence of warm current A. Only the finding of *Leptodius occidentalis* at Hood Island in 1925, as recorded by Boone (1927) is incompatible with this scheme. In order to appreciate the significance of the occurrence of this Gulf of California littoral species at the most southerly island of the group, and to understand the manner in which Gulf of California and Peruvian species may have reached the outposts of the Galapagos archipelago, it is necessary to consider the general scheme of circulation of ocean currents in the Eastern Tropical Pacific.

## OCEAN CURRENTS

### (CHARTS IV-VII)

The accompanying Chart, IV, compiled from various sources, shows that four ocean currents are concerned in the movement of water masses in the region bounded by the Gulf of California on the north, the coast of Peru on the south, and the Bay of Panama on the east. These are the California Current, the Equatorial Countercurrent, the Niño Current, and the Peruvian or Humboldt Current.

The California current sweeps down the west coast of Lower California, turning southwestward off Cape San Lucas, rather than continuing down the coast of Mexico, part of it becoming the westwardly-directed North Equatorial Current. Two thousand miles or more offshore it impinges upon the Equatorial Countercurrent, which is traveling in almost the opposite direction, due east. Upon reaching the mainland of Central America a portion of this current turns northward and westward along the Mexican coast, and a portion is deflected southward and eastward to join the Niño Current of the Bay of Panama.

The Niño Current is normally found only as far south as Punta Santa Elena, Ecuador. Its waters are warm, 86° F. being an observed surface temperature. Average salinity is said to be 33.00 ‰ (Sverdrup, 1942, p. 705). Seasonally, from January to April, it extends its influence southward, meeting the northerly-directed Peruvian Coastal Current at a point south of Guayaquil and deflecting it away from the coast of South America.



The Peruvian Current, with its coastal and oceanic subdivisions, is a portion of the largest ocean current in the world, the Antarctic Circumpolar Current, deflected northward by the tip of South America. It carries polar water with little change in temperature from southern Chile almost to the Equator. An observed surface temperature is  $66^{\circ}$  F. in the Galapagos Islands, 35.00 ‰ an average saline content. Unlike the Niño Current, the Peruvian Current is permanent and unidirectional, unvarying except as it may be seasonally deflected away from the South American mainland north of Latitude  $12^{\circ}$  S.

A seasonal and cyclical analysis of ocean currents off the northwest coast of South America is given by Schott (1931), from whose work the accompanying three charts are taken. Chart V shows normal current displacement during August and September, which are winter months south of the Equator. During these months the Galapagos Islands are completely surrounded by cold water, the coldest axis of the Peruvian Current passing just south of the islands of Charles and Hood.

Chart VI shows the normal current displacement in February and March, the summer season south of the Equator. At this season the body of warm water, represented by diagonal striping, moves southward to include the islands of Culpepper and Wenman, almost reaching the tip of Albemarle Island. According to observations of the Hancock Expedition members, this warm water does reach Albemarle Point and inundates the channel between Albemarle and James, as previously related.

Chart VII shows an unusual disturbance which took place in 1891. In that year the belt of warm water was pushed southward past the Galapagos Islands to Callao, Peru, and beyond, seriously upsetting the meteorological and biological equilibria. The arid coasts of southern Ecuador and Peru were deluged by tropical rainfall. Millions of guano-producing birds were destroyed in the Peruvian coastal islands. The important fact to be noted is that the Galapagos Islands were completely immersed in warm equatorial waters. Such an occurrence takes place in milder proportions every seven years, according to Murphy (1936), with serious disturbances about every thirty-fourth year. Murphy presents substantial proof that these serious disturbances of 1891 and 1925 were not caused by the Niño current, but were invasions of the southern hemisphere by the Equatorial Countercurrent (*op. cit.*, p. 103). Schott (*op. cit.*) records twelve such disturbances since 1791, the most serious known being that of 1925. It will be recalled that the single record of a Gulf of California species of *Brachyura* on the extreme southern island of Hood, that of *Leptodius occidentalis*, was in this year. Thus the

system of water circulation observed in the Galapagos Islands, plus that known to exist in the greater Pacific area, including demonstrable irregularities, are together capable of accounting for the present recognized distribution of brachyuran species within the archipelago, if the oceanic transportation of larval stages is assumed.

## EXTRA-GALAPAGAN DISTRIBUTION

(See also Table of Distribution)

Galapagos species which enjoy the greatest longitudinal range, practically encircling the globe, are confined to the zone of warm equatorial waters, which in the Eastern Pacific is compressed into a comparatively narrow belt found mostly north of the Equator, or between 4° S. and 24° N. Latitude. Four Galapagos species are common to the Atlantic, American- and Indo-Pacific Oceans. *Grapsus grapsus*, *Geograpsus lividus*, and *Planes minutus* are members of the family Grapsidae, among the most highly evolved of the Brachyura, the first two found in the spray zone, the third as a log rider. *Domestia hispida*, a member of the family Xanthidae, is a commensal of the *Pocillopora* coral.

Four species are common to the Galapagos Islands and the Western Pacific and Indian Oceans which are not represented in the Atlantic. Three of these are members of the family Xanthidae, which reaches its greatest development in the tropics. The fourth is a grapsoid, *Plagusia immaculata*, commonly known as the Pacific Log Rider. While the great majority of the Xanthidae are free living species, those common to the Galapagos and Indo-Pacific are all obligatory commensals in corals. *Carpilodes cinctimanus*, *Trapezia cymodoce ferruginea*, and *T. digitalis* are found only in coral of the genus *Pocillopora*, while two other xanthids with strong Indo-Pacific ties, *Maldivia galapagensis* and *Quadrella nitida*, are found only in coral of the genus *Pavona* and on the gorgonian, *Muricea miser*, respectively. This is taken to mean, not that the commensal species arrive in relatively greater numbers than the free living but that the accustomed habitat is greater assurance of survival. The fact that the Galapagos *Maldivia* is very close to, if not conspecific with, the *Maldivia* of Palmyra, which lies in approximately the same Latitude as Cocos but south of Hawaii, would seem to indicate the Equatorial Countercurrent as the means of dispersal involved. The speed of this current approaches 2 knots (Sverdrup, 1942, p. 709).

The seven species common to the Galapagos and the Atlantic, but not the Western Pacific, include three grapsoids: *Pachygrapsus transversus*, *Percnon gibbesi*, and *Euchirograpsus americanus*, the latter reported from

the Pacific for the first time by Hancock Expeditions. The remaining four, *Cycloës bairdii*, *Acanthonyx petiverii*, *Cronius ruber*, and (tentatively) *Tetraxanthus rathbunae*, are free living species representing as many different families and about them no generalization seems possible.

Galapagos species enjoying the greatest latitudinal range are closely restricted to American shores. *Mursia gaudichaudii*, an oxystome, occurs from the Farallone Islands, off San Francisco, to Valparaiso, Chile. *Dromidia larraburei* ranges north to Monterey Bay, while *Stenorynchus debilis* is found from Magdalena Bay, Lower California, to Chile. All are dredged species and each is the sole representative of its genus in the Eastern Pacific. Usually several species of a genus replace each other along such a continuous coast line. When the break between species occurs with consistent regularity in a number of genera and families it becomes possible to delimit regions each of which supports a characteristic aggregation of brachyuran species. Several such faunal provinces will be mentioned in the discussion which follows.

The largest number of Galapagos brachyuran species common to any continuous portion of the adjacent mainland are the 48 species which occur from the Gulf of California to southern Ecuador or northern Peru. If to these be added the 15 species common to the Galapagos and the Bay of Panama alone, the total of 63 species gives the Galapagos brachyuran fauna the unmistakable stamp of the Panamic province. It also indicates the predominating influence of the warm Niño Current which emanates from the Bay of Panama from January to April and which may have served to transport larval stages to Galapagos shores.

The eleven species common to the Galapagos and the Gulf of California—Lower California region but not recorded from the Central American coast are evidence of the infiltration of a north temperate fauna. *Microphrys triangulatus* may be taken as an example of a Gulf of California species not represented in the Bay of Panama (except at Cocos Island) but well established in the Galapagos. The fact that other Galapagos species are common to the intermediate outposts of Clarion or Socorro (*Ebalia hancocki*, *Clythrocerus laminatus*, and *Leptodius cooksoni*) suggests that these islands, along with Cocos and perhaps Clipperton, Chart IV, may have served as stepping stones for current-borne larval stages. The California Current and Equatorial Counter-current would appear to supply the needed transportation.

Of the nine species listed as common to the Galapagos and the Subantarctic faunal region alone, the Peruvian or Chilean records in four cases rest upon century-old reports which have not been recently verified. Apart from these doubtful records, *Mithrax bellii*, *M. nodosus*, *Leptodius*

*cooksoni*, and *Eriphia granulosa* are to all intents and purposes Galapagos endemic species. Of the remaining five, *Pinnaxodes chilensis* is commensal with a common Peruvian sea urchin, *Strongylocentrotus gibbosus*. The free-living *Eupleurodon rathbunae* and *Microphrys aculeatus*, the distribution of which has been discussed, as well as *Taliepus marginatus* and *Pisoides edwardsii*, unrecorded from the islands since Cuming's time, are found on brown algae, a fact which lends credence to the drift method of arrival via the Peruvian Current. Contrary to its magnitude, this current appears to have exerted but a minor influence on the composition of the Galapagos brachyuran fauna. This is no doubt due to its seasonal and cyclical displacement from Galapagos waters by Niño Current and Equatorial Countercurrent phenomena, as previously explained, which acts to prevent the poikilothermic portion of the Subantarctic fauna from becoming permanently established in the archipelago as have the holothermic penguin and fur seal.

### ATLANTIC ANALOGUES

(See also Table of Distribution)

As indicators of former geologic relationships in the Central American region, second only in importance to those species which occur on both sides of the Isthmus of Panama are those which occur in the Pacific only but which have counterparts in the Atlantic from which they are scarcely distinguishable. Such species are known as "twin", geminate, or representative species and are more closely related than are ordinary species. Their occurrence has been considered among echinoderms by Verrill (1867), among brachyurans by Rathbun (1899 *et seq.*) and among fishes by Jordan (1908), to mention only a few. They are considered as valid evidence that the Atlantic and Pacific Oceans were confluent at a comparatively recent time, probably lower Pliocene (Vaughan, 1919). Charts VIII, IX, and X, after Schuchert (1935), show the location of three such oceanic connections since middle Oligocene.

A total of 38 Galapagos brachyuran species are considered by Rathbun (1918, 1925, 1930, 1937) to possess such analogues. This fraction, which represents over 30 percent of the number recorded for the islands, is the largest segment of the brachyuran population to which a common *origin* can be assigned. It indicates an older and more fundamental relationship between faunas than that which is based upon the occurrence of the same species in each of them. It also suggests the former existence of a strong current flowing in a westerly direction through the Panama Portal which may have served for the transportation of larval crustaceans in the same manner that the California, Niño, Peruvian Currents, and Equatorial Countercurrent appear to serve today.

While the great majority of the 38 Galapagos species having Atlantic analogues occur among the large group of species common to the Panamic province, not all Galapagos Brachyura possessing such analogues are to be found in this category. One or two species having analogues are to be found among those common to the Galapagos and to north or south temperate waters alone. This is understandable in view of the fact that the Rathbun designations of analogous Atlantic and Pacific species represented comparisons of the two faunas as a whole, irrespective of the lesser provinces into which each might ultimately be divided, and that morphological resemblance, rather than continuity of habitat, was the determining factor in establishing relationship.

It is assumed, to begin with, that the analogous species, Pacific and Atlantic, were one species occupying a continuous range at the time of the Isthmian closure and that the slight morphological differences which separate them have arisen since that time. Consequently, species now occupying the Bay of Panama which do not possess Atlantic analogues are believed to represent recent arrivals. It follows that their more strongly differentiated characteristics, requiring greater time in development, have been attained in another portion of their present or immediate past range. In the case of Panamanian species now common to both Gulf of California and Galapagos, this place of origin might have been either the Gulf of California or the Galapagos; in the case of Panamanian species common only to the Galapagos, it would seem to have been the Galapagos alone.

Galapagos species without analogues now inhabiting the Bay of Panama, 30 in number, may be broken down into the following groups: (a) species belonging to genera excluded from the Atlantic, and therefore without analogous possibility, 11; (b) species having one or more Pacific congeners, one of which is analogous to the single Atlantic member of the genus, 4; (c) species belonging to certain genera, mostly oxystomatous, to which recent new species have been added, leaving species on both sides of the continent for which there is no accepted pairing, 6. Thus but nine Galapagos species remain whose presence without analogues in the Bay of Panama must be otherwise explained.

It is reasonable to expect that a large number of current-borne species would have been drawn into the vortex of the Bay of Panama from outlying regions in response to the shift in oceanic circulation which must have taken place with the union of the two continents by a land bridge. That some of these might have arrived from the Galapagos Islands with the assistance of a current of the required magnitude and direction is even more credible than that species should have reached the Galapagos from

more distant trans-Pacific islands. As in the case of the latter, the Equatorial Countercurrent would appear to provide the necessary motility.

In the light of this reasoning, the occurrence of the Galapagos endemic species, *Platypodia gemmata*, at Taboga Island, Panama, in 1925 as reported by Finnegan (1931) may be attributed to the same cause as the record of the Gulf of California species, *Leptodius occidentalis*, at Hood Island, Galapagos, in the same year as reported by Boone (1927): the invasion of the Southern Hemisphere by the Equatorial Countercurrent in years of exceptional disturbance such as 1891 and 1925 (*cf.* Murphy, *op. cit.*). Such years would appear propitious for the establishment of Galapagos species on Central and northern South American shores. Their survival beyond the first generation in the new environment would be the exceptional occurrence; witness the failure of Hancock Expeditions to duplicate either record in the relatively stable period of 1931-39.

While species common to the Galapagos Islands and the tropical American mainland should possess Atlantic analogues unless belonging to one of the classes previously enumerated, there should exist no comparable relationship between the Atlantic species and those common to the Galapagos and either of the temperate faunas alone. Thus the 11 species common to the Galapagos and Gulf of California regions and none other, with the exception of the two anomalous species mentioned below, have no Atlantic analogues. Nor have the 5 which remain common to the Galapagos and Subantarctic region (Chile and Peru) alone, after the exclusion of the four species previously mentioned of which the early mainland records are in doubt. (*Taliepus marginatus*, a Peruvian species not present in the Bay of Panama, is said to occur in the Atlantic in view of the fact that its non-existent type was attributed, perhaps erroneously, to Brazil.)

The present study cannot be fairly concluded without mentioning two species the recorded distribution of which cannot be satisfactorily explained by this reasoning. *Leptodius cooksoni* is found at Socorro and Clarion, the Galapagos, and questionably, Chile. Furthermore, although not present in the Bay of Panama, it is said to have an Atlantic analogue. Any one of these relationships is possible, but the three together are incompatible with distributional theories which present the Galapagos as a region of universal convergence only. *Leptodius occidentalis*, common to the Gulf of California and Galapagos, but not found in the Bay of Panama, is said to be analogous to *L. floridanus*. Here the species is definitely of the northern fauna and the question becomes one of a past link between the Gulf of California region and the Gulf of Mexico,

rather than between the Bay of Panama and the Caribbean, and an appropriate subject for discussion in a paper on distribution of Brachyura of the Gulf of California, rather than of the Galapagos.

### GALAPAGOS ENDEMIC SPECIES

In considering the 23 species which have been taken only in waters of the Galapagos Islands, the question of what constitutes a Galapagos endemic species arises. If a given species is found only in the Galapagos Islands but shows a closer morphological relationship to an Atlantic species than to any Pacific member of its genus, in other words, is geminate, it may be assumed that the two species existed as one in Central American waters prior to the Isthmian closure. In this case the Galapagos species may be expected to occur in Pacific Panamanian waters unless very recent extinction has occurred. If, on the other hand, a species found only in Galapagos waters shows no greater affinity to a Caribbean species than to the nearest Pacific member of its genus, *i.e.*, is not geminate, it may be assumed that it was not an inhabitant of Central American coastal waters in Pliocene times. It is evident that such a species must have occupied the Galapagos Islands for a period of time sufficient to have become specifically distinct from either the American or Asiatic stock<sup>1</sup> from which it was originally derived. It is to the latter group that the writer would apply the word endemic, in a more restricted sense than usual, indicating that the species may be demonstrated to have originated in the archipelago by evidence other than its having been taken only there.

It is obvious that no true Galapagos endemic species should have an Atlantic analogue. However, *Mithrax bellii*, *Portunus angustus*, *Actaea angusta*, and *Osachila galapagensis*, taken only in the Galapagos to date, are said by Rathbun (1925, 1930, 1937) to possess such analogues. Following the reasoning of the last paragraph, these species, if true analogues, should be expected to occur in the Bay of Panama. However, the discovery in Pacific Panamanian waters of species which could be demonstrated to be even more closely related to the Atlantic representatives than the Galapagos species would resolve the question equally well, but in favor of the endemic nature of the latter. Such a solution undoubtedly occurred with the discovery at Bahia Honda, Panama, by the 1939 Allan

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<sup>1</sup> Lest it be thought that the 23 Galapagos endemic species of Brachyura have been derived in whole or large part from Indo-Pacific sources, it should be stated that 9 are members of the Majidae, a family strictly of western hemispheric origin, while 7 of the 9 endemic Xanthidae can be traced to a more nearly related American than Old World species.

Hancock Expedition of *Osachila sona*, in every detail a better counterpart of the Atlantic *O. antillensis* than the currently accepted analogue, *O. galapagensis*.

The writer also considers as probably endemic certain insular species now common to Central American mainland shores which evidence shows did not originate there. These are Galapagos species having one or more Pacific congeners, one of which is analogous to the single Atlantic member of the genus. *Menippe obtusa* and *M. frontalis* both occur in the Bay of Panama. *M. obtusa*, found also in the Galapagos, has no Atlantic analogue, whereas *M. frontalis*, not found in the Galapagos, is analogous to the Atlantic *M. mercenaria*. The Galapagos origin of *M. obtusa* would therefore seem to be strongly indicated. Similar examples are *Platypodia gemmata* and *P. rotundata*, the latter analogous to the Atlantic *P. spectabilis*, and perhaps *Ocypode gaudichaudii* and *O. occidentalis*, the latter analogous to the Atlantic *O. albicans*. The possible Galapagos origin of the first named in each case has not previously been suggested.

The foregoing concept leaves the number of Galapagos endemic species unchanged at 23, although it alters slightly the composition of the list. It does, however, strengthen the endogenous nature of this fraction of the Galapagos brachyuran fauna by presenting it as a possible source of enrichment of the American mainland fauna. An even stronger argument for the Galapagos origin of certain Central American brachyuran forms will be presented in the discussion of distribution of genera.

Previously discussed under extra-Galapagan distribution were several species common to the Galapagos and other islands of the Eastern Pacific, particularly Clarion and Socorro, but not to the American mainland. These were grouped with Gulf of California species because, like them, they appear to have been transported to the Galapagos by the California Current and the Equatorial Countercurrent. That the migration has proceeded predominantly in a southerly and easterly direction is indicated by the prevailing direction of these currents and by the fact that, whereas Gulf of California species are found at Clarion, Socorro, and Galapagos, no Galapagos endemic species has so far been recorded from the Gulf of California.

A corollary to this assumption would appear to be that species in question must have originated at Clarion or Socorro. This is not impossible, but is unlikely when one of them, *Leptodius cooksoni*, is a dominant Galapagos shore form said to have analogous Atlantic affinities. These islands, along with San Benedicto and Roca Partida, form the



Revilla Gigedos, an archipelago of a sort; similar in origin to the Galapagos and supporting an authentic, if limited, endemic population. Each island group stands athwart a great oceanic current, the two so nearly comparable that they have been called mirrored images of one another (see Chart IV). Some hundreds of miles west of the Galapagos, waters of both streams, on coming into contact with the edges of the Equatorial Countercurrent, are subjected to a transverse circulation (Sverdrup, *op. cit.*, p. 711) and may actually interchange to some degree. That planktonic forms of Galapagos origin could be cast back on the Revilla Gigedos in a period of instability involving the invasion of Northern Hemisphere waters (between 10° and 20° N. Lat.) by the Equatorial Countercurrent, with accompanying displacement of the California Current, is at least a theoretical possibility, although such a shifting of the meteorological Equator would involve a deflection opposite to that known periodically to occur. Such a phenomenon would account most plausibly for the occurrence of Galapagos endemic species at Socorro and Clarion, and would allow for the analogous Atlantic, or even the direct Chilean, relationship claimed for *L. cooksoni*. In any event, the Galapagos Islands cannot well be overlooked as a factor in considering the faunas of other Eastern Pacific islands, either as a site of possible origin or as a relay station between them and more remote localities.

### DISTRIBUTION OF GENERA

As pointed out by Finnegan (1931): "The entire circumtropical, or Indo-Pacific-American and American-African faunas, are knit together not so much by their species as by their genera. . . The explanation of this would seem to be that genera, being much older than species, were established at a time when barriers now in existence, such as the Isthmus of Panama, did not impede their migration." Clearly Galapagos Brachyura are no exception to this principle, for it is immediately apparent that the relationship of the Galapagos fauna to the Indo-Pacific is better indicated by genera than by species, there being 10 of the former common to the two regions and to none other, as against but 5 of the latter. An additional 20 genera were found to be common to western Pacific, Galapagan, and Caribbean waters. Obviously these were established on the American coast while the Panamanian portal was in existence, the 10 genera excluded from the Caribbean having put in their appearance after its closure.

While the waters of the Galapagos Islands support 23 indigenous brachyuran species, but one genus, *Ectaesthesius*, which is not found elsewhere, occurs in the archipelago. However, the Galapagos Islands share with adjacent Pacific coastal waters several other monotypic genera, *Lipaesthesius*, *Lophoxanthus*, and *Eriphides*, which are excluded from the Atlantic. Thus the single species of each genus has no Atlantic analogue, a fact which precludes its having been present in the Bay of Panama, which it now occupies, as recently as Pliocene times. Yet having seen that since late Pliocene only those species have evolved, the geminate species, which are less distinct from one another than are ordinary species, the question naturally arises: in what region have these organisms existed while evolving differences which separate them generically as well as specifically from all other crabs? It would seem that the only possibility for such isolation within the territory they now occupy is the Galapagos Islands. Are not they, then, to be considered Galapagos endemic genera like *Ectaesthesius* which, unable to reach American mainland shores against the westerly-directed current of the Panama Portal, have reached them since its closure? According to this view, the Galapagos Islands have existed from times sufficiently remote to have witnessed the differentiation of genera as well as of species, and have served as a reservoir supplying adjacent coastal waters with new and highly specialized brachyuran forms.

### DISTRIBUTION OF FAMILIES

Fifteen families of Brachyura are represented in Galapagos waters. These families are encountered in waters of the American mainland, but two others of particular significance are also present: the families Goneplacidae and Gecarcinidae, the latter including the land crabs. Members of the first named family, mostly dredged, may well be excluded from the Galapagos by ecological factors, the absence of the detritus-rich mud bottoms to be found on the opposite mainland, or of the increasingly fresh water to be found as one approaches the mouths of great rivers, such as the San Juan. There is no apparent reason, however, why members of the second family, and particularly, *Gecarcinus planatus*, should be absent from the red gumbo which borders many Galapagos lagoons, or why *Aratus pisonii*, a member of the sesarmid section of the Grapsidae, should be excluded from their mangrove-fringed margins. The former is the dominant west coast land crab, while the latter is the ubiquitous mangrove crab of the American tropics. The presence of these species in the Galapagos would not in itself be conclusive evidence

of the formation of the islands by subsidence of the mainland mass (Baur, 1891, 1895, 1897), *G. planatus* having found its way to Socorro, San Benedicto, Clipperton, and Malpelo. However, had the islands been so formed it is scarcely conceivable that one or both families would not have persisted. Their absence, therefore, is in keeping with the theory of independent, volcanic origin proposed by Darwin (1839, 1845), in which chance has been largely responsible for subsequent faunal accretions.

To one who inclines toward the latter view, the assemblage of brachyuran species, genera, and families which now inhabits the Galapagos littoral appears as definite a faunal entity as do those of Hawaii, the Azores, or any group of oceanic islands. The confluence of mighty ocean currents which converge upon the archipelago from each of three American faunal provinces and from trans-Pacific islands determines that the small but stable endemic population shall occupy a subordinate position to the large and diverse increment of current-borne species, while the geographical proximity of the islands to the continental mass decrees that a relatively large proportion of these shall be drawn from the more highly developed fauna of the tropical American shore. As these vagrants become established and their differentiation proceeds, barring always changes in oceanic circulation which would force them back in numbers, the Galapagos brachyuran fauna will become increasingly distinctive, and will no longer be considered merely an extra-territorial extension of either the Panamic or Peruvian faunas, as has been previously advocated.

### SUMMARY OF DISTRIBUTION

(1) The system of oceanic circulation observed in the Galapagos Islands, plus that known to exist in the greater Pacific area, are together capable of accounting for the now recognized distribution of brachyuran species within the archipelago on the basis of oceanic transportation of larval stages alone.

(2) The 11 species of Galapagos Brachyura common to Caribbean waters and the 38 Galapagos species represented by analogous Atlantic species are the largest group to which a common origin can be assigned. They indicate the former transportation of larval stages by a westerly-directed current flowing through the Panama Portal over the present Isthmus of Panama.

(3) The 63 Galapagos species common to the American mainland from the Gulf of California to the Bay of Panama or to the Bay of Panama alone are evidence of the predominant influence of the Panamic Province upon the Galapagos brachyuran fauna. Except in the cases of

species possessing analogues which may have reached the islands directly from the Caribbean via the Panama Portal, recent seasonal transportation of larval stages by the Niño Current is indicated.

(4) The 11 Galapagos species common to the Gulf of California-Lower California region alone are evidence of the infiltration of a north temperate fauna, with the transportation of larval stages by the California Current and the Equatorial Countercurrent indicated.

(5) The 5 Galapagos species common to the coast of Chile or Peru alone are evidence of a lesser infiltration of the Subantarctic fauna, with the Peruvian Coastal Current indicated as the means of transportation of such species as have arrived.

(6) The 5 Indo-Pacific species and 2 species with close Indo-Pacific ties found in the Galapagos Islands indicate the transportation of larval forms from trans-Pacific islands by the Equatorial Countercurrent.

(7) The relation of the Galapagos fauna to the Indo-Pacific is better indicated by genera, of which there are 10 common to both regions and to none other, than by species, of which there are but 5.

(8) Not only have species and genera originating elsewhere made large contributions to the Galapagos fauna, but species, and even genera, originating in the Galapagos Islands have made a smaller, but none the less significant, contribution to the brachyuran faunas of the mainland and of adjacent islands.

(9) The absence from the Galapagos of the families Goneplacidae and Gecarcinidae, and of the Sesarminae section of Grapsidae, is in keeping with the volcanic theory of origin of the archipelago as proposed by Darwin (1845), rather than with the subsidence theory proposed by Baur (1891).

## CHECK LIST OF GALAPAGOS BRACHYURA AND TABLE OF EXTRA-GALAPAGAN DISTRIBUTION

The accompanying table is intended to serve both as a check list of Galapagos Brachyura and as a graphic recapitulation of previously discussed distributional relationships of the 120 brachyuran species known to occupy the Galapagos littoral.

An asterisk (\*) indicates a family, genus, or species recorded for the first time in the Galapagos as a result of the work of Allan Hancock Expeditions.

(†) indicates a species new to science as a result of taxonomic studies made of Hancock Expedition collections.

(‡) indicates a species which has not been taken again in Galapagos waters since its type was obtained by Cuming circa 1829.

The symbol x indicates the presence of the species itself in the faunal division shown at the head of the column.

The symbol x? indicates an early record of the species which is subject to reasonable doubt.

The symbol (x) indicates an unpublished mainland record obtained by explorations of the *Velero III* which sheds new light upon the distribution of the species.

The letters *an* indicate the presence of an analogous species in the faunal division shown at the head of the column.

The word *tie* indicates the presence of a closely related, but not analogous, species.

A geographical name in parentheses indicates that the species, while hardly a *bona fide* member of the mainland fauna listed at the head of the column, occurs in such proximity to it that a common method of transportation to or from the Galapagos may have served.

Species excluded from the list which follows and from the writer's Galapagos Brachyuran Fauna (1946) for reasons stated therein include the following: *Calappa saussurei* Rath., *Teleophrys tumidus* (Cano), *Panopeus bradleyi* Smith, *Pachygrapsus crassipes* Randall, and *Uca macrodactylus* (M. Edw. & Luc.)

For the distributional purposes of this list, and without prejudice to the writer's taxonomic studies, *Epialtus peruvianus* is considered conspecific with *Eupleurodon rathbunae*, and *Stenocionops macdonaldi* with *S. triangulata*.

CLASSIFICATION	DISTRIBUTION OF SPECIES			
	<i>Galapagan Species</i>	<i>Atlantic</i>	<i>Gulf Cal.</i>	<i>Panamic Sub-Ant. Indo-Pac.</i>
<b>*RANINIDAE</b>				
*RANINOIDES				
†*ecuadorensis Rath.....		(x)	x	
*RANILIA				
*fornicata (Faxon).....	an	x	x	
<b>DROMIIDAE</b>				
DROMIDIA				
larraburei Rath.....	an	x	x	
*HYPOCONCHA				
*panamensis Smith.....	an	x	x	
<b>*DYNOMENIDAE</b>				
*DYNOMENE				
*ursula Stimp.....		x	x	
<b>*DORIPPIDAE</b>				
*ETHUSA				
*lata Rath.....	an	x	x	
*CLYTHROCERUS				
†laminatus Rath.....		(Clarion)		
<b>LEUCOSIIDAE</b>				
*EBALIA				
†hancocki Rath.....		(Socorro)		
*LITHADIA				
*cumingii Bell.....	an	x	x	
*UHLIAS				
*ellipticus Stimp.....	an	x	x	
<b>PERSEPHONA</b>				
†edwardsii Bell.....			x	
<b>LEUCOSILIA</b>				
jurinei (Saussure).....			x	
*RANDALLIA				
*agaricias Rath.....		x	x	
<b>CALAPPIDAE</b>				
<b>CALAPPA</b>				
convexa Saussure.....	an	x	x	
*MURSIA				
*gaudichaudii (M. Edw.)..		x	x	x
<b>CYCLOËS</b>				
bairdii Stimp.....	x	x	x	
*OSACHILA				
†galapagensis Rath.....				
*levis Rath.....		x	x	

CLASSIFICATION	DISTRIBUTION OF SPECIES				
<i>Galapagan Species</i>	<i>Atlantic</i>	<i>Gulf Cal.</i>	<i>Panamic</i>	<i>Sub-Ant.</i>	<i>Indo-Pac.</i>
<b>MAJIDAE</b>					
STENORYNCHUS					
debilis Smith.....	an	x	x		x
*ANOMALOTHIR					
†hoodensis Garth.....	an				
PODOCHELA					
margaritaria Rath.....					
†schmitti Garth.....					
*EUPROGNATHA					
*granulata Faxon.....			(Cocos)		
DASYGYIUS					
‡gibbosus (Bell).....					
‡depressus (Bell).....		x	x		
ACANTHONYX					
petiverii M. Edw.....	x	x	x		x
*EUPLEURODON					
†rathbunae Garth.....					x
TALIEPUS					
marginatus (Bell).....	x?				x
*SPHENOCARCINUS					
*agassizi Rath.....	an	x	x		
PELIA					
‡pulchella Bell.....					
PISOIDES					
‡edwardsii (Bell).....			x?		x
HERBSTIA					
edwardsii Bell.....					
pyriformis (Bell).....					
LISSA					
aurivilliusi Rath.....	an	x	x		
THOE					
‡erosa Bell.....			x		
PITHO					
quinquedentata Bell.....	an	x	x		
sexdentata Bell.....	an		x		
MITHRAX (Mithrax)					
spinipes (Bell).....	an	x	x		
bellii Gerst.....	an				x?
pygmaeus Bell.....			x		
MITHRAX (Mithraculus)					
nodosus Bell.....					x?
‡denticulatus Bell.....	an	x	x		
TELEOPHRYS					
cristulipes Stimp.....	an	x	x		

CLASSIFICATION		DISTRIBUTION OF SPECIES			
	<i>Galapagan Species</i>	<i>Atlantic</i>	<i>Gulf Cal.</i>	<i>Panamic</i>	<i>Sub-Ant. Indo-Pac.</i>
STENOCIONOPS					
	*triangulata (Rath.).....	an	x	x	
	†ovata (Bell).....				
MICROPHRYS					
	aculeatus (Bell).....				x
	triangulatus (Lock.).....		x	(Cocos)	
	*platysoma (Stimp.).....	an	x	x	
*TYCHE					
	*lamellifrons Bell.....	an	x	x	
PARTHENOPIDAE					
	PARTHENOPE (Platylambrus)				
	exilipes (Rathbun).....	an	x	x	
	PARTHENOPE (Pseudolambrus)				
	*triangula (Stimp.).....		x	(La Plata)	
*DALDORFIA					
	†garthi Glassell.....		x	x	tie
*SOLENOLAMBRUS					
	*arcuatus Stimp.....	an		x	
*MESORHOEA					
	*bellii (A.M. Edw.).....	an	x	x	
*AETHRA					
	*scruposa.....				
	scutata Smith.....		x		tie
PORTUNIDAE					
	PORTUNUS (Achelous)				
	stanfordi Rath.....				
	angustus Rath.....	an			
	*tuberculatus (Stimp.).....		x	x	
CRONIUS					
	ruber (Lamarck).....	x	x	x	x
*EUPHYLAX					
	*dovii Stimp.....			x	x
*ATELECYCLIDAE					
	*KRAUSSIA				
	†americana Garth.....		x	x	tie
XANTHIDAE					
	CARPILODES				
	cinctimanus (White).....		x	x	x
PLATYPODIA					
	gemmata Rath.....			x	
	rotundata (Stimp.).....	an	(x)	x	



CLASSIFICATION	DISTRIBUTION OF SPECIES			
	<i>Galapagan Species</i>	<i>Atlantic</i>	<i>Gulf Cal. Panamic</i>	<i>Sub-Ant. Indo-Pac.</i>
ACTAEA				
dovii Stimp.....	an	x	x	
angusta Rath.....	an			
*sulcata Stimp.....	an	x	x	
crosslandi (Finn.).....				
GLYPTOXANTHUS				
†hancocki Garth.....				
DAIRA				
americana Stimp.....		x	x	tie
LIPAESTHESIU				
leeanus Rath.....		x	(x)	
MEDAEUS				
lobipes Rath.....	an	x	x	
spinulifer (Rath.).....		x	(x)	
CYCLOXANTHOPS				
vittatus (Stimp.).....		x	x	
LEPTODIUS				
occidentalis (Stimp.).....	an	x		
snodgrassi Rath.....				
cooksoni Miers.....	an	(Clarion)		x?
		(Socorro)		
LOPHOXANTHUS				
lamellipes (Stimp.).....		x	x	
*LOPHOPANOPEUS				
*maculatus Rath.....		x	(x)	
*HEXAPANOPEUS				
†cartagoensis Garth.....				
EURYPANOPEUS				
transversus (Stimp.).....			x	x
EURYTUM				
affine (Streets & Kingsley)..		x		
MICROPANOPE				
xantusii (Stimp.).....	an	x	(x)	
polita Rath.....	an	x	(Cocos)	
†fraseri Garth.....				
*TETRAAXANTHUS				
*rathbunae Chace.....	x			
ECTAESTHESIU				
bifrons Rath.....				
PARAXANTHIAS				
insculptus (Stimp.).....		x		
MENIPPE				
obtusa Stimp.....			x	

CLASSIFICATION	DISTRIBUTION OF SPECIES				
<i>Galapagan Species</i>	<i>Atlantic</i>	<i>Gulf Cal.</i>	<i>Panamic</i>	<i>Sub-Ant.</i>	<i>Indo-Pac.</i>
<b>PILUMNUS</b>					
xantusii Stimp.....	an	x	(x)		
pygmaeus Boone.....		(x)	(x)		
<b>*ACIDOPS</b>					
*fimbriatus Stimp.....		x			
<b>OZIUS</b>					
verreauxii Saus.....		x	x		
perlatus Stimp.....	an	x	x		
tenuidactylus (Lock.).....		x	x		
<b>ERIPHIA</b>					
squamata Stimp.....	an	x	x		
granulosa A.M. Edw.....				x?	
<b>ERIPHIDES</b>					
hispida (Stimp.).....			x		
<b>DOMECIA</b>					
hispida Eydoux & Souleyet..	x	x	x		x
<b>TRAPEZIA</b>					
cymodoce					
ferruginea Latr.....		x	x		x
*digitalis Latr.....		x	x		x
<b>*QUADRELLA</b>					
*nitida Smith.....		x	x		tie
<b>*MALDIVIA</b>					
†galapagensis Garth.....					tie
<b>PINNOTHERIDAE</b>					
<b>*PARAPINNIXA</b>					
†glasselli Garth.....					
<b>*PINNIXA</b>					
*transversalis					
(M. Edw. & Luc.).....	an		x		
<b>PINNAXODES</b>					
chilensis (M. Edw.).....				x	
<b>CYMOPOLIIDAE</b>					
<b>*CYMOPOLIA</b>					
*cortezi Crane.....		x			
*fragilis Rath.....		x	x		
†velerae Garth.....					
*lucasii (Rath.).....	an	x	(x)		
<b>GRAPSIDAE</b>					
<b>GRAPSUS</b>					
grapsus Linn.....	x	x	x		x
<b>GEOGRAPSUS</b>					
lividus (M. Edw.).....	x	x	x	x	(Hawaii)
<b>PACHYGRAPSUS</b>					
transversus (Gibbes).....	x	x	x	x	

CLASSIFICATION	DISTRIBUTION OF SPECIES				
<i>Galapagos Species</i>	<i>Atlantic</i>	<i>Gulf Cal.</i>	<i>Panamic</i>	<i>Sub-Ant.</i>	<i>Indo-Pac.</i>
PLANES					
<i>minutus</i> (Linn.).....	x	x	x		x
*EUCHIROGRAPSUS					
* <i>americanus</i> A. M. Edw.....	x				
PLAGUSIA					
<i>immaculata</i> Lamarck.....			x		x
PERCNON					
<i>gibbesi</i> (M. Edw.).....	x	x	x	x	
OCYPODIDAE					
OCYPODE					
<i>gaudichaudii</i>					
M. Edw. & Luc.....			x	x	
UCA					
<i>galapagensis</i> Rath.....					
<i>helleri</i> Rath.....					

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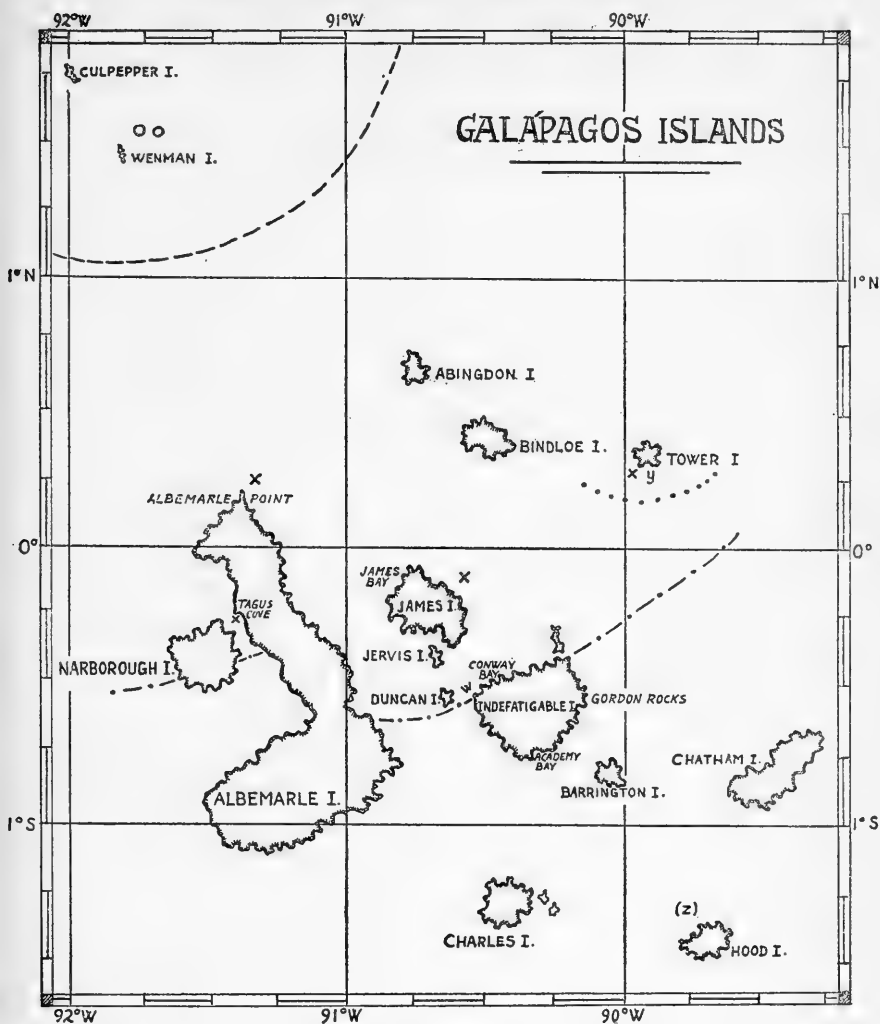


CHART I

Galapagos Distribution of six Gulf of California Species, with hypothetical southern Limit of Range of Each.

<i>Cymopolia cortezi</i>	o, ---	<i>Pilumnus xantusii</i>	x, ----
<i>Cymopolia fragilis</i>	o, ---	<i>Microphrys platysoma</i>	y, . . .
<i>Eurytium affine</i>	w, ----	<i>Leptodius occidentalis</i>	z

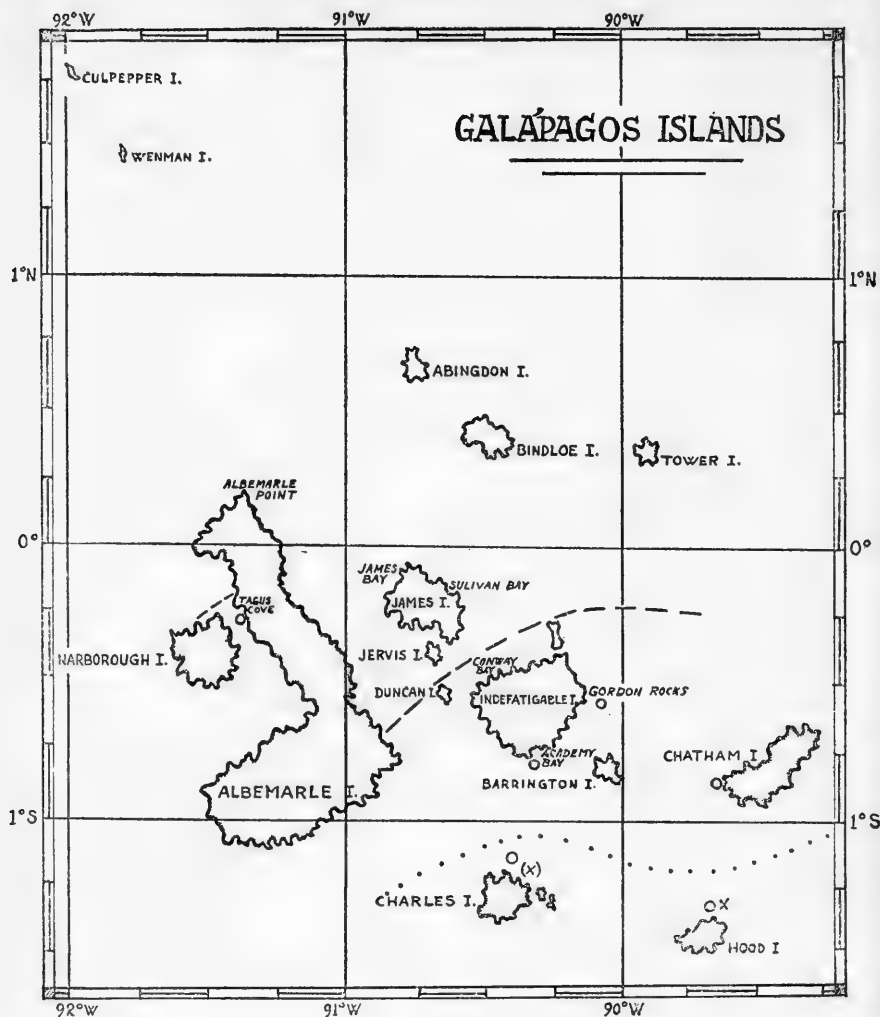


CHART II

Galapagos Distribution of two Peruvian Species, with hypothetical northern Limit of Range of Each.

*Microphrys aculeatus*

o, - - -

*Eupleurodon rathbunae*

x, . . .

(= *Epialtus peruvianus*)





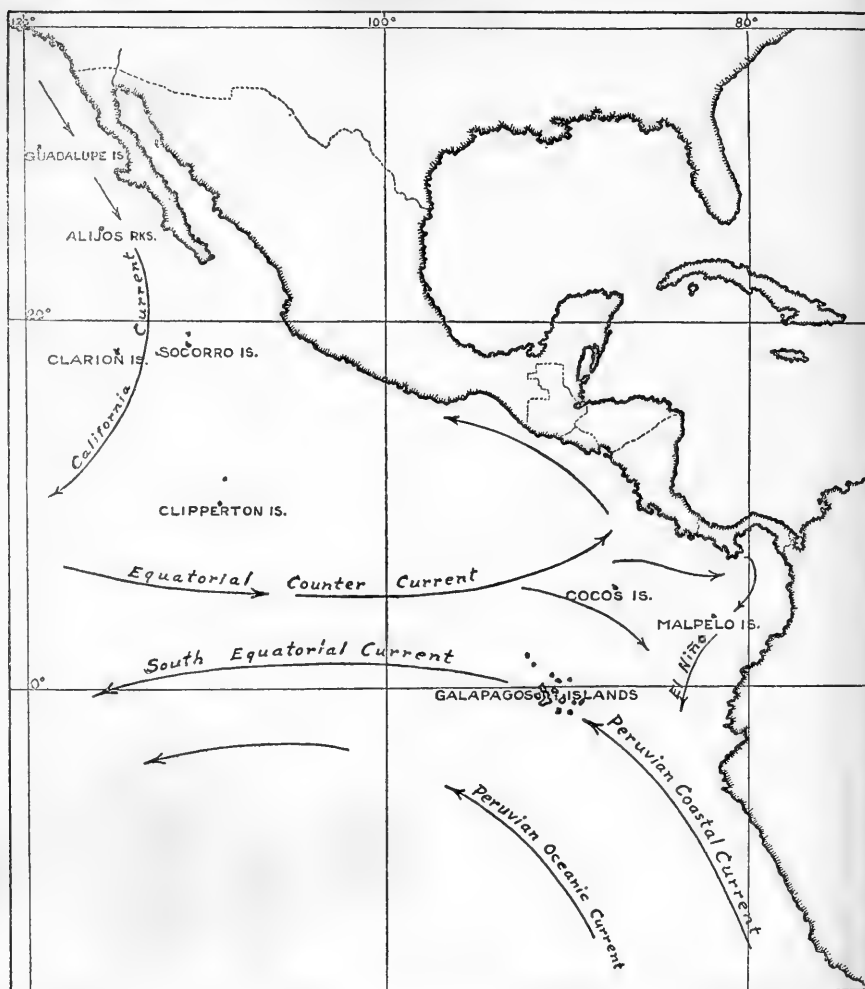


CHART IV

Chart showing normal Course of principal ocean Currents in the Eastern Tropical Pacific and possible Island stepping-stones for current-borne larval Stages.

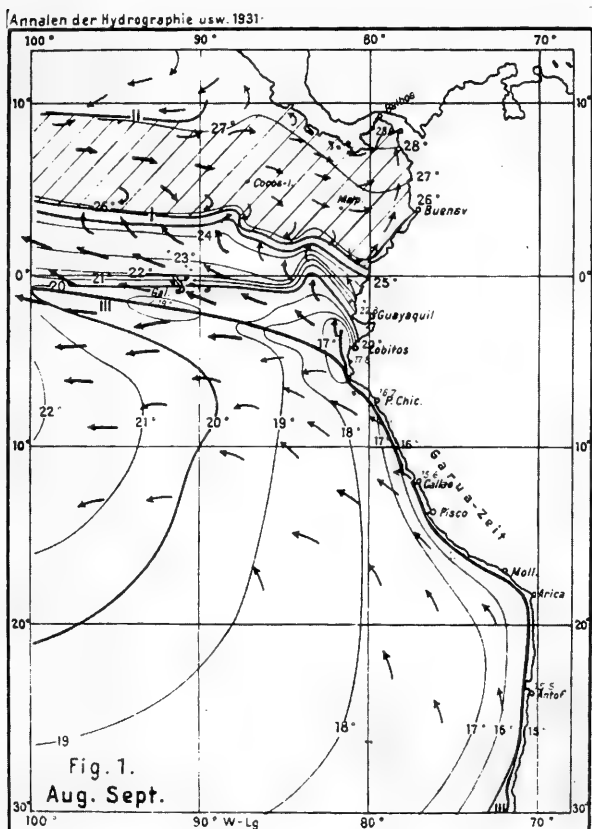


CHART V

Water Temperature and normal current Displacement in August and September (Southern Hemisphere Winter). (Temperature in degrees Centigrade). Charts V, VI, and VII after Schott (1931).

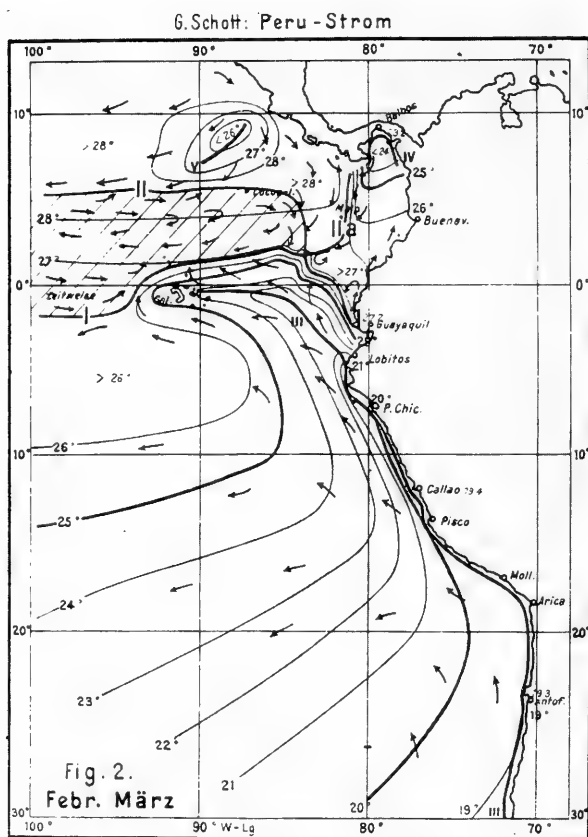


CHART VI

Water Temperature and normal current Displacement in February and March  
(Southern Hemisphere Summer).

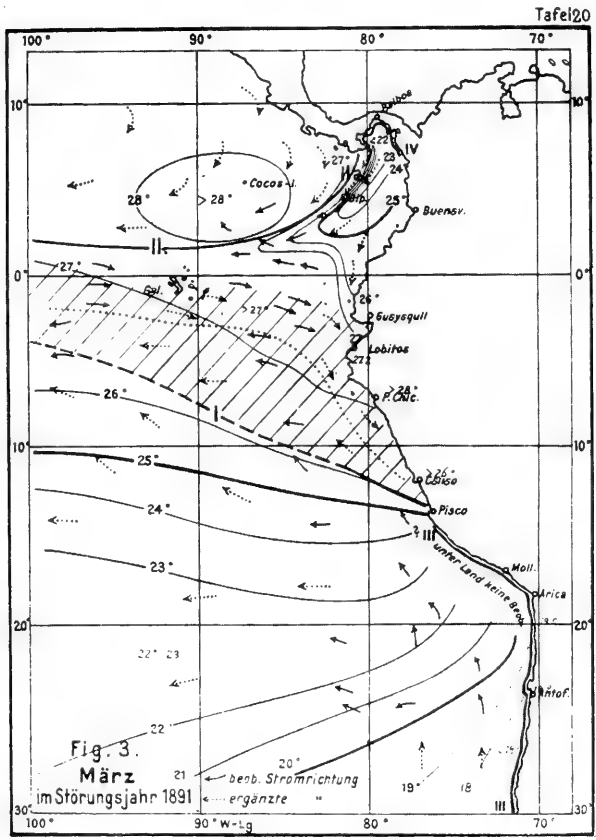
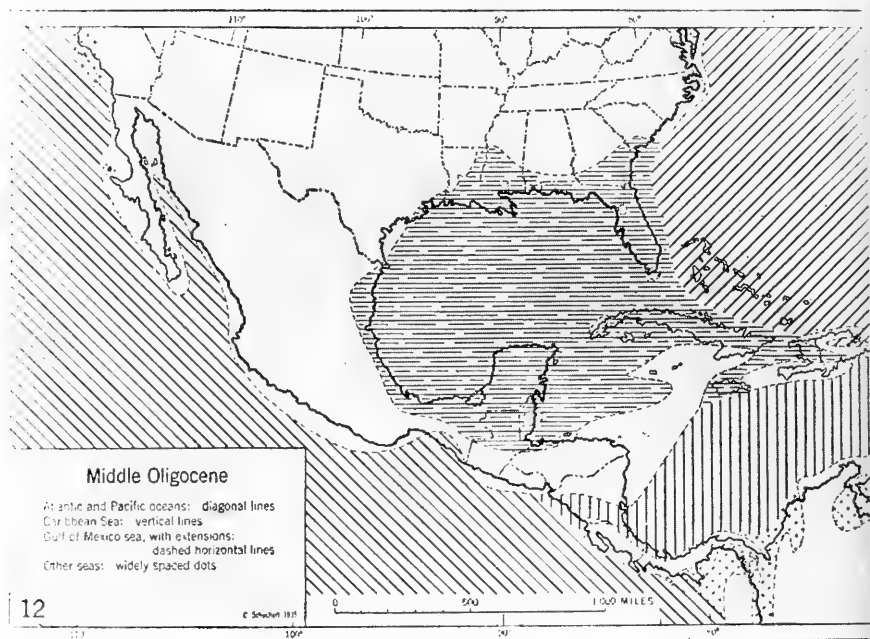


CHART VII

Water Temperature and abnormal current Displacement in Year of Disturbance, 1891.



## CHART VIII

Former Confluence of Atlantic and Pacific Oceans in Middle Oligocene.

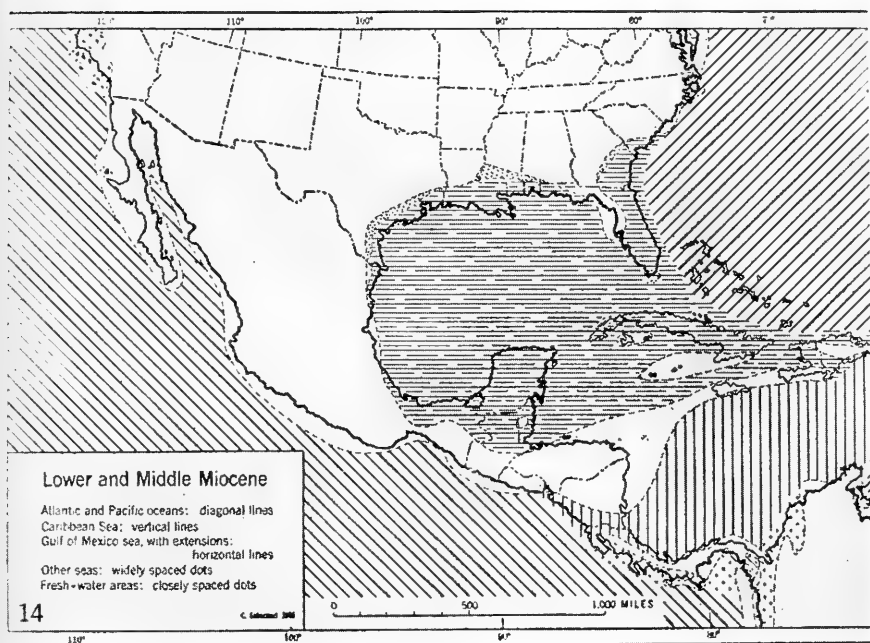


CHART IX

Former Confluence of Atlantic and Pacific Oceans in Lower and Middle Miocene.

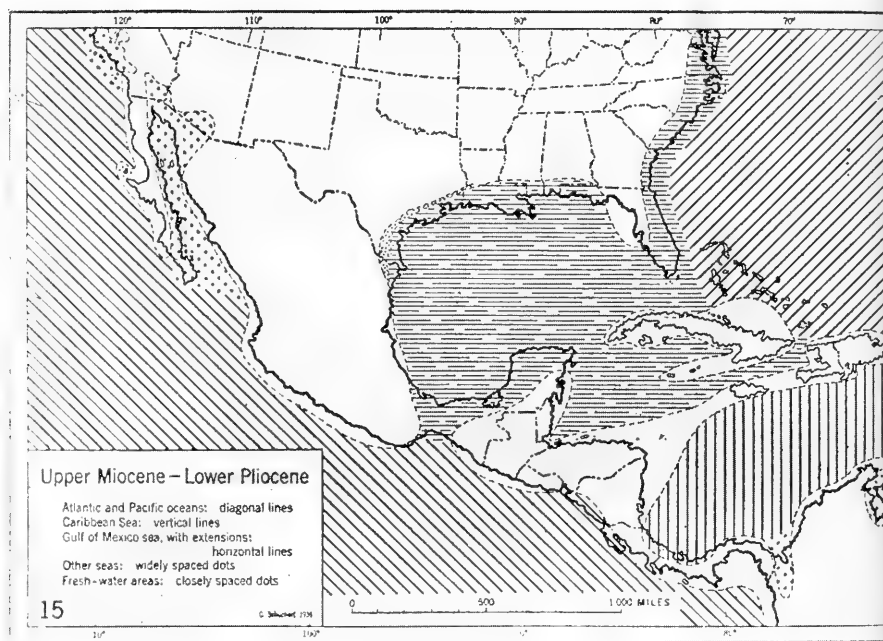


CHART X

Former Confluence of Atlantic and Pacific Oceans in Upper Miocene-Lower Pliocene.

(Charts VIII, IX, and X reprinted by permission from 'Historical Geology of the Antillean-Caribbean Region' by C. Schuchert, published by John Wiley & Sons, Inc., New York.)







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### Corrections

- p. 366 for *Leptodia* read *Leptopodia*.
- p. 375 for *Microrynchus* read *Microrhynchus*.
- p. 405 for thy read they.
- p. 426 for Crane, Zoologica, vol. 12 read Crane, Zoologica, vol. 22.
- p. 476 for *peraltus* read *perlatus*.
- p. 554 for *Anamalothir* read *Anomalothir*.
- p. 621 for *Stenorynchus debilis* Smith read *Stenorynchus debilis* (Smith).
- p. 624 for *Grapsus grapsus* Linn read *Grapsus grapsus* (Linn).

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NUMBER 1

## THREE NEW ANOMURAN CRABS FROM THE GULF OF CALIFORNIA

by

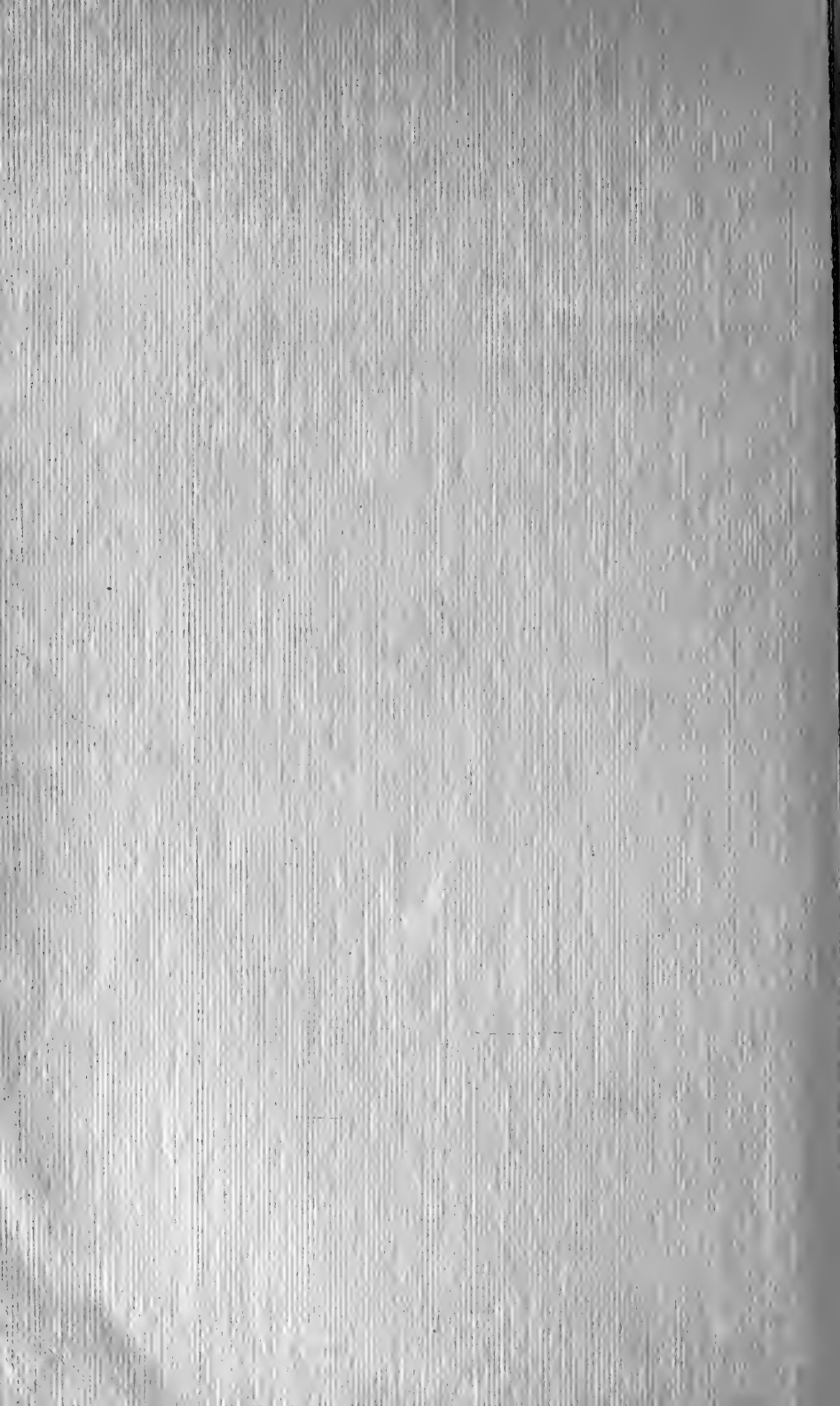
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NEW BRACHYURAN CRABS FROM THE  
GALAPAGOS ISLANDS

(PLATES 1-10)

by

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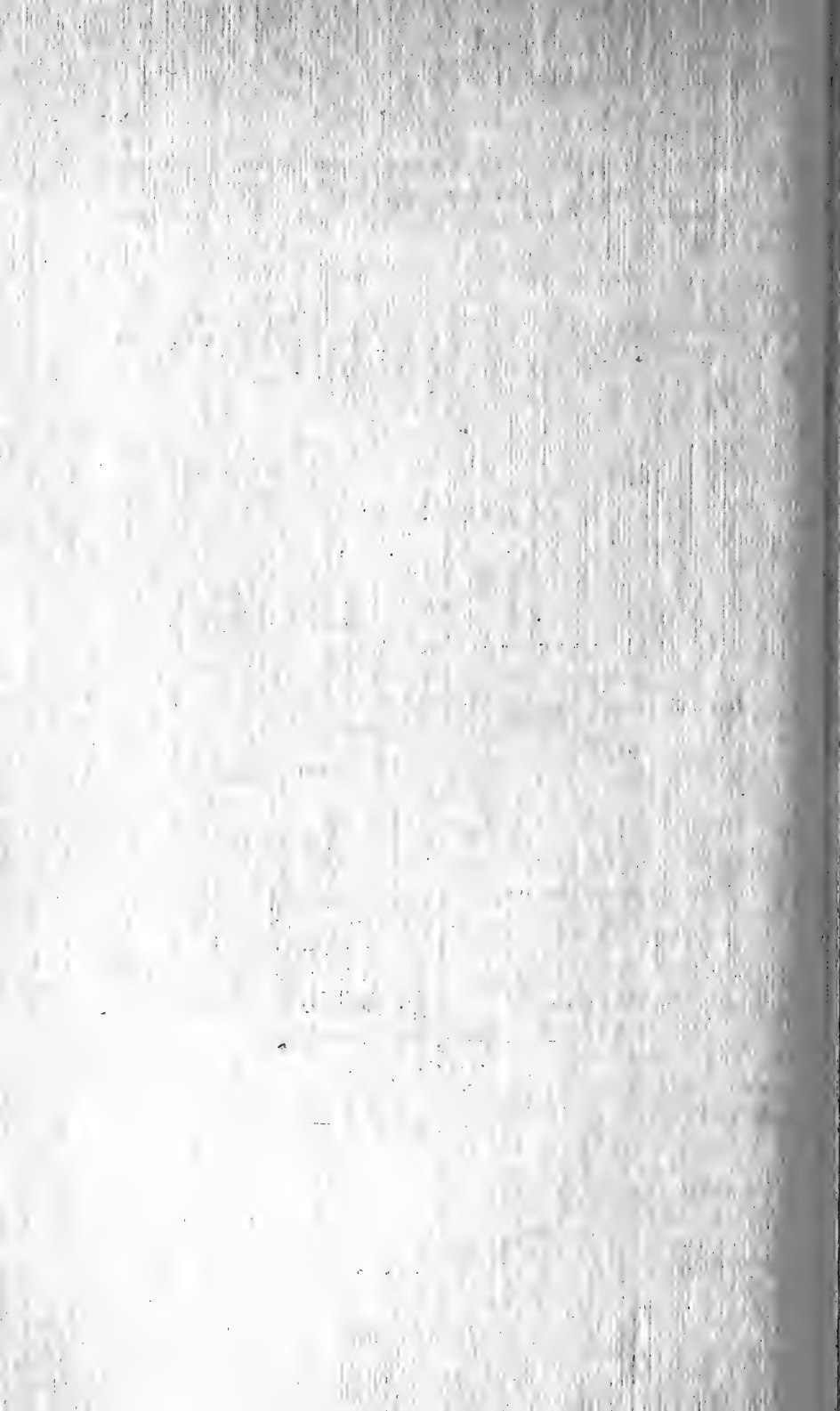
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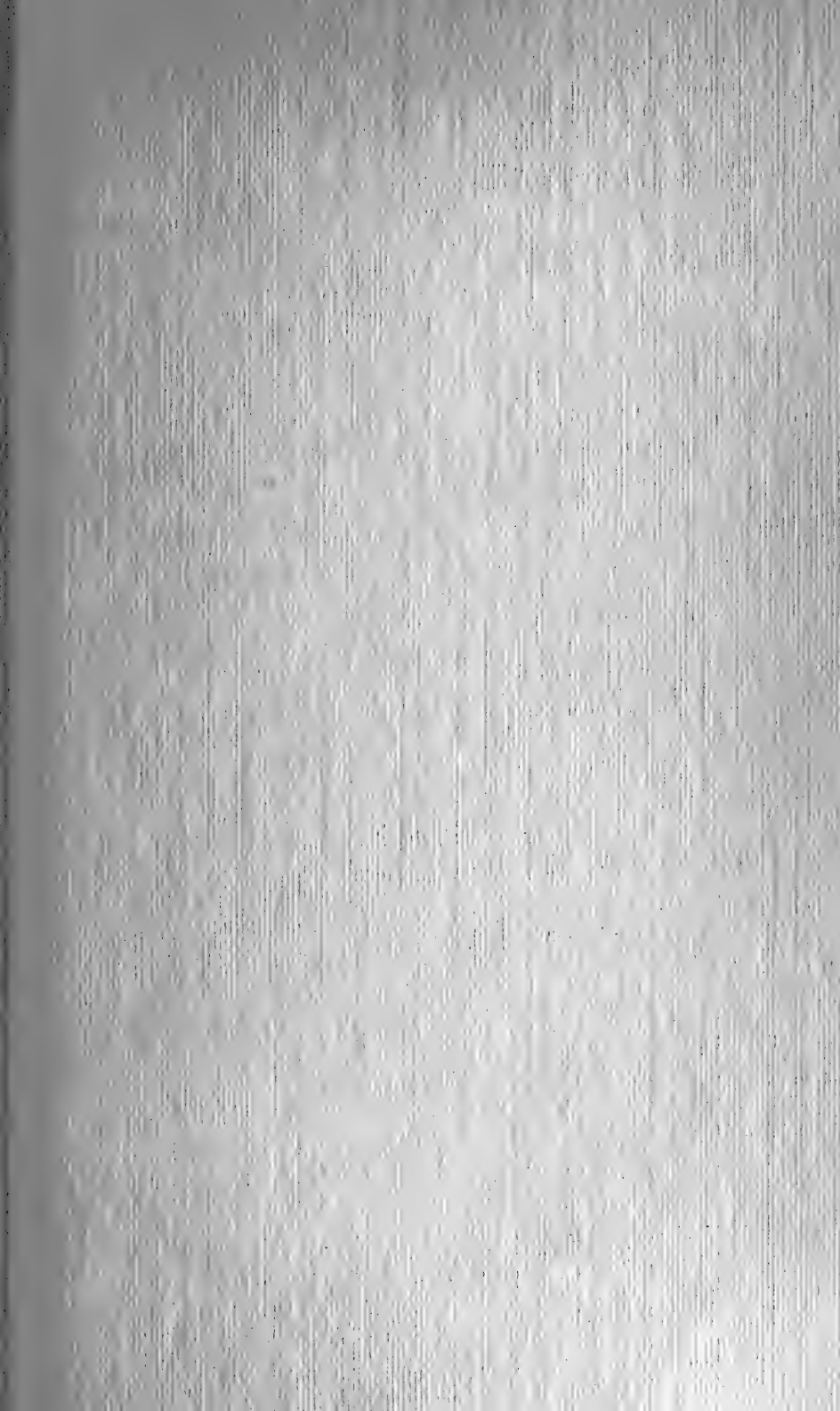
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## SOME NEW SPECIES OF BRACHYURAN CRABS FROM MEXICO AND THE CENTRAL AND SOUTH AMERICAN MAINLAND

(PLATES 11-26)

by

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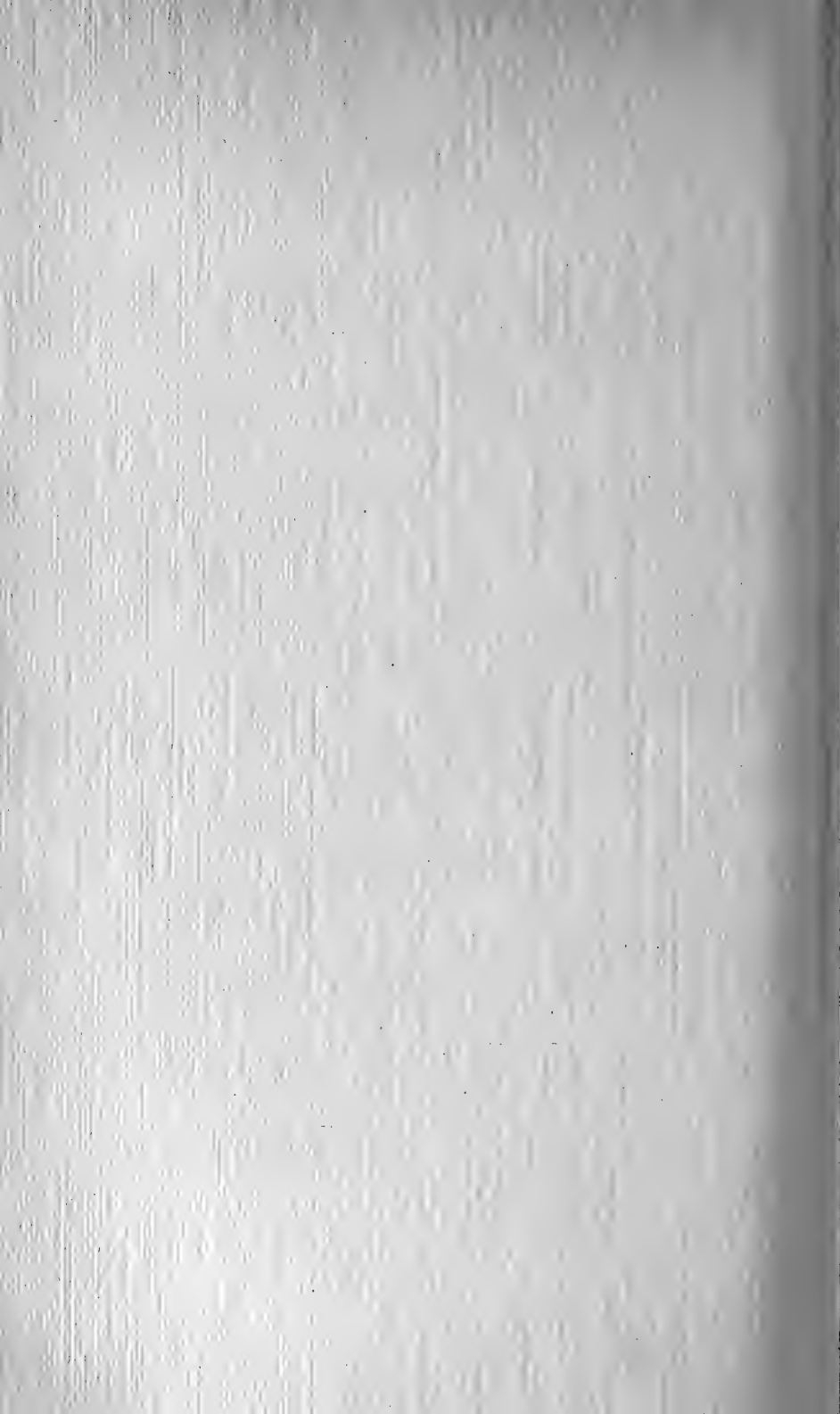
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THE STOMATOPODS OF THE WEST COAST  
OF AMERICA

Based on Collections Made by the Allan Hancock Expeditions, 1933-38

(33 TEXT FIGURES)

by

WALDO L. SCHMITT

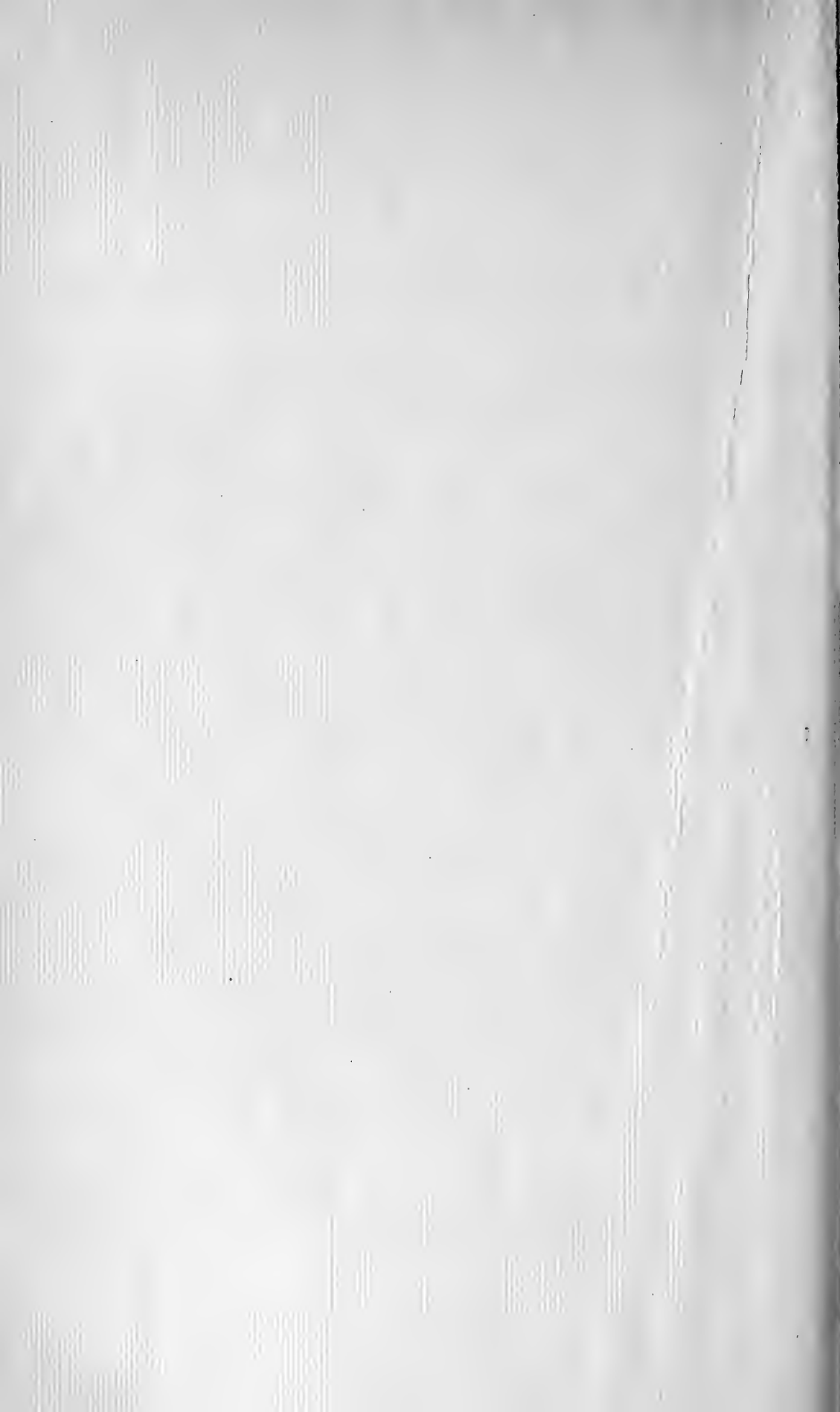
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## A NEW GENUS AND SPECIES OF BARNACLE FROM ECUADOR

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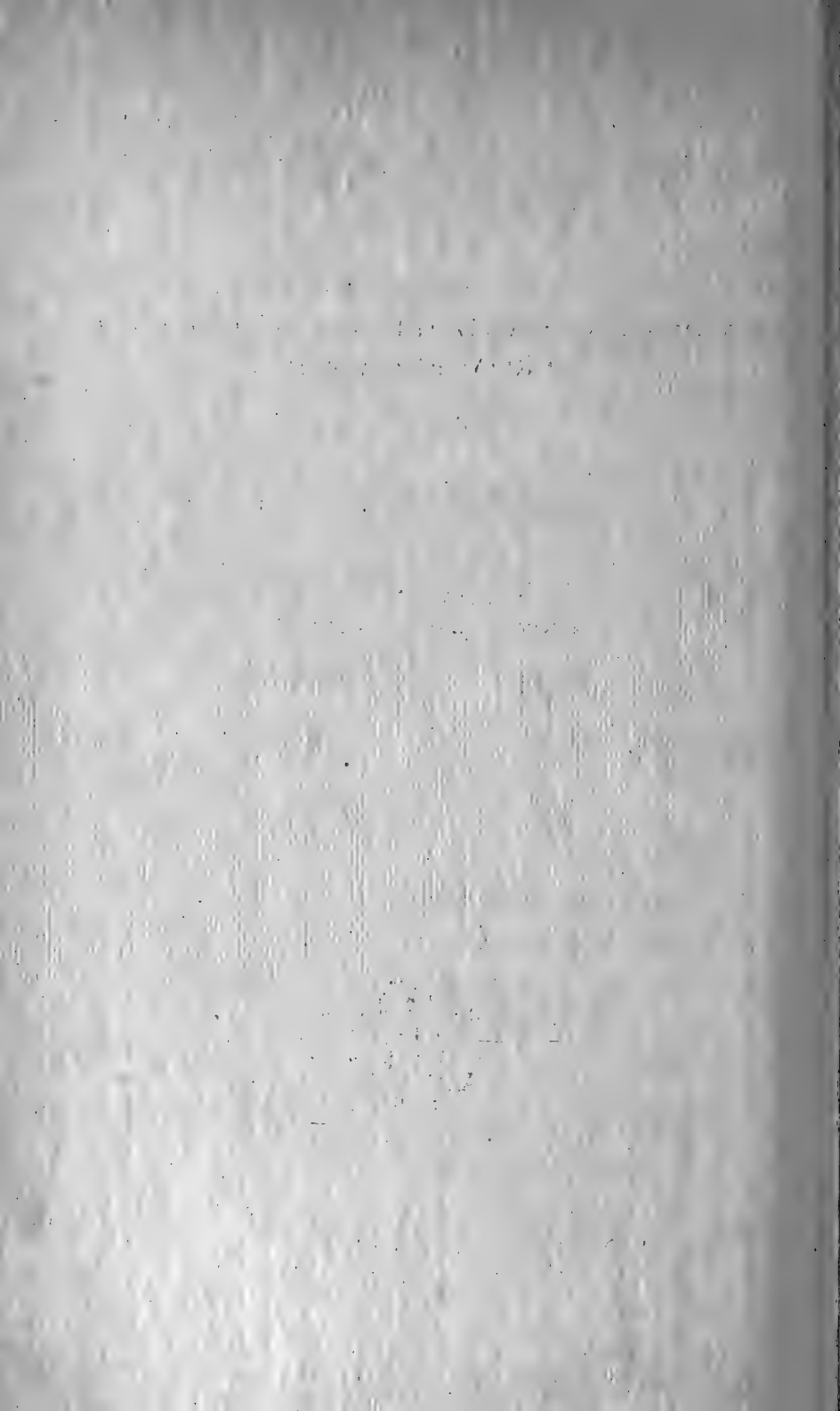
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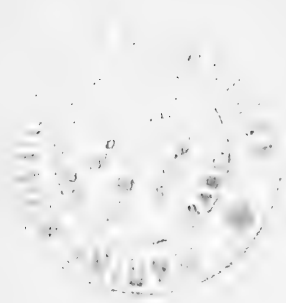
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## THE MALE GENITALIA OF *EPIPOMPONIA* *MULTIPUNCTATA* (DRUCE) (Lepidoptera, Epipyropidae) (PLATE 34)

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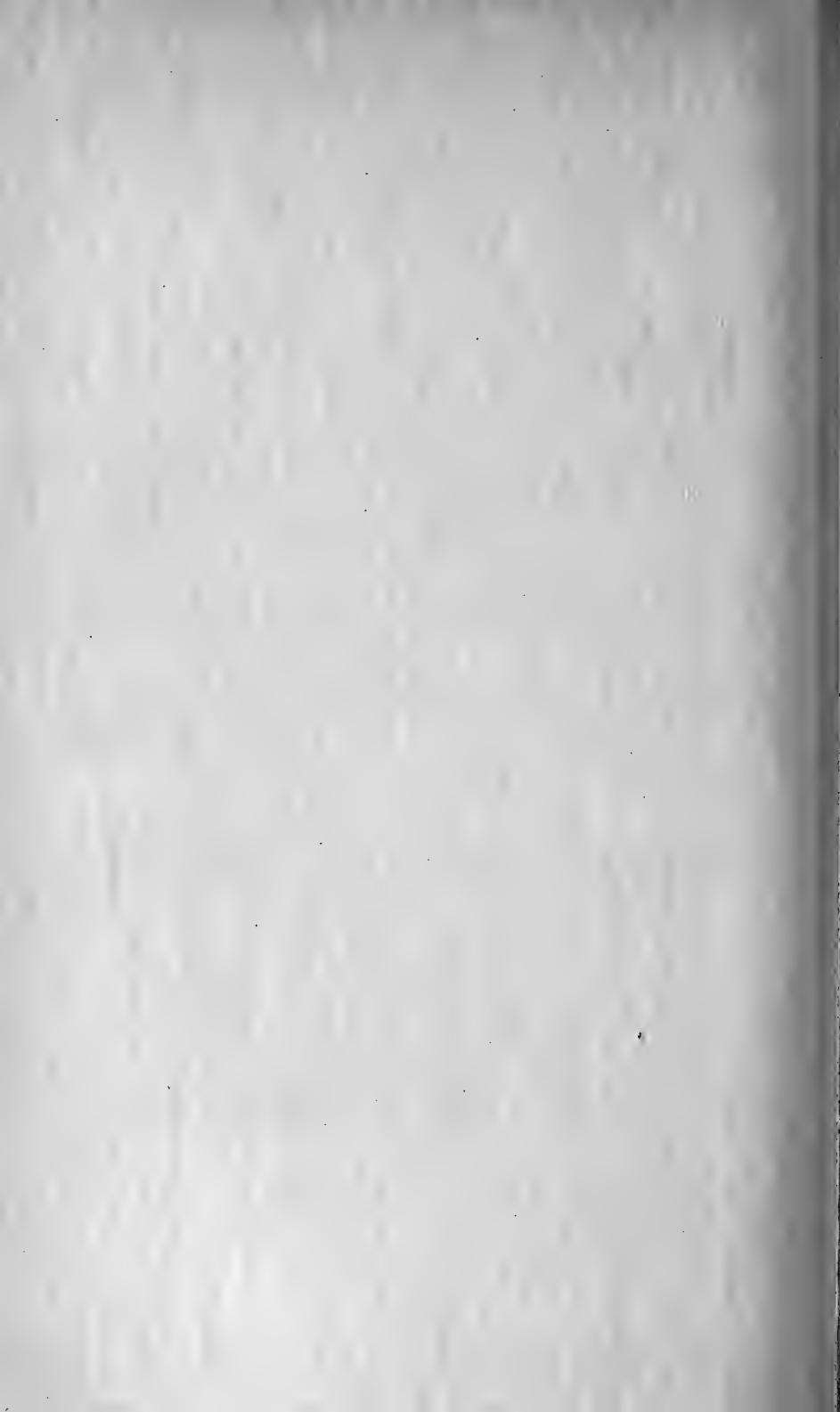
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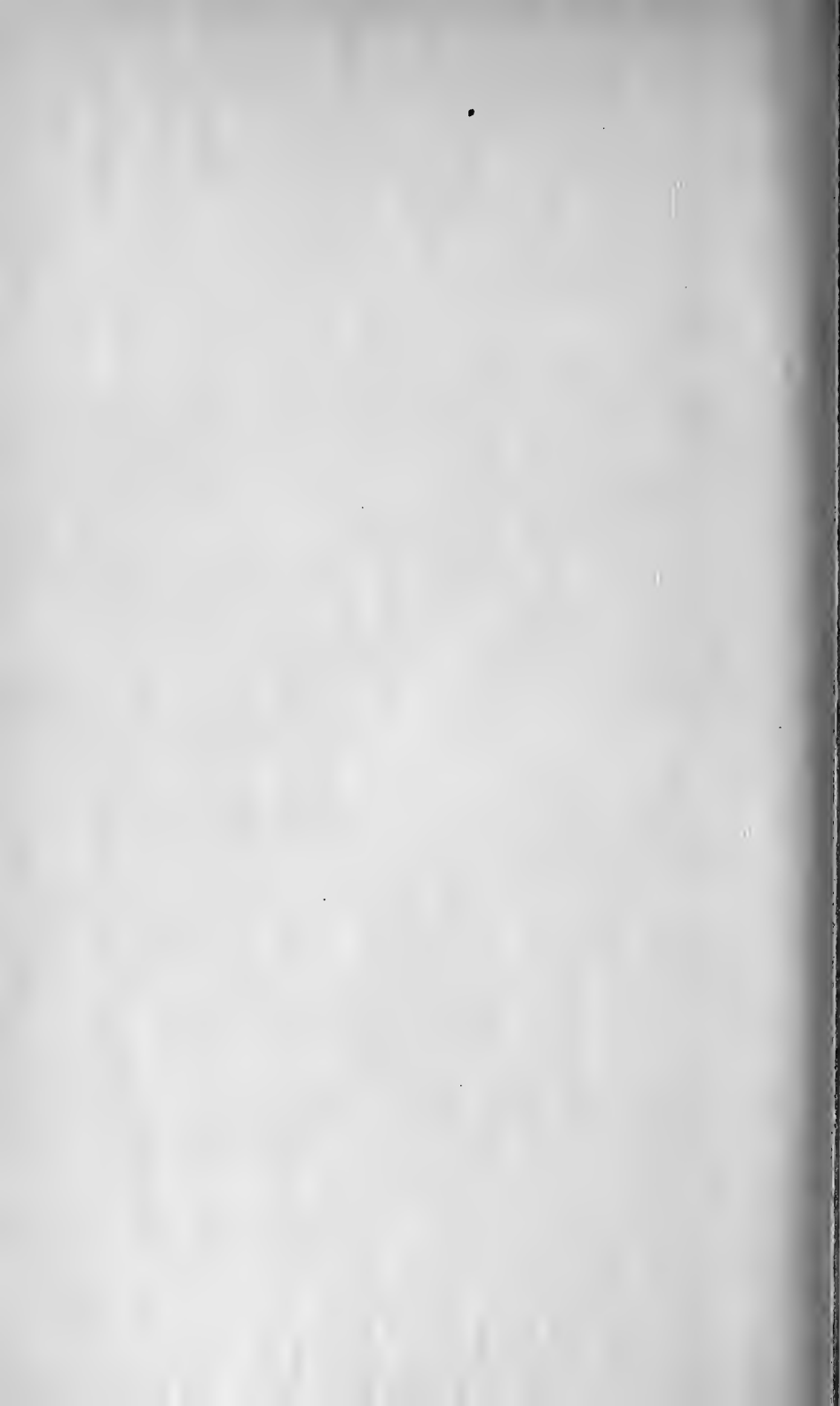
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## LITTORAL BRACHYURAN FAUNA OF THE GALAPAGOS ARCHIPELAGO

(PLATES 49-87; 1 TEXT FIGURE)

by

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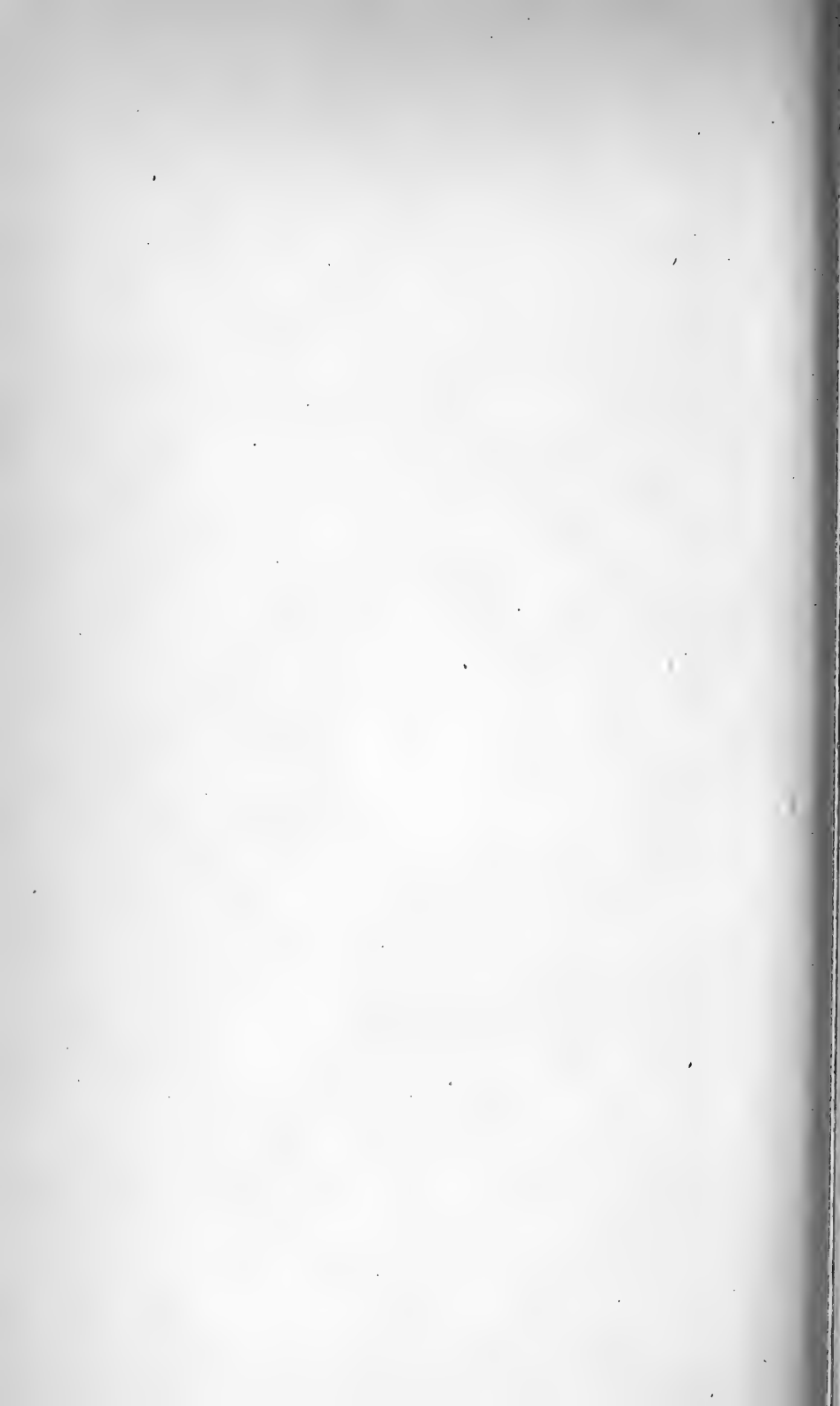
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DISTRIBUTION STUDIES  
OF GALAPAGOS BRACHYURA

(CHARTS 1-10)

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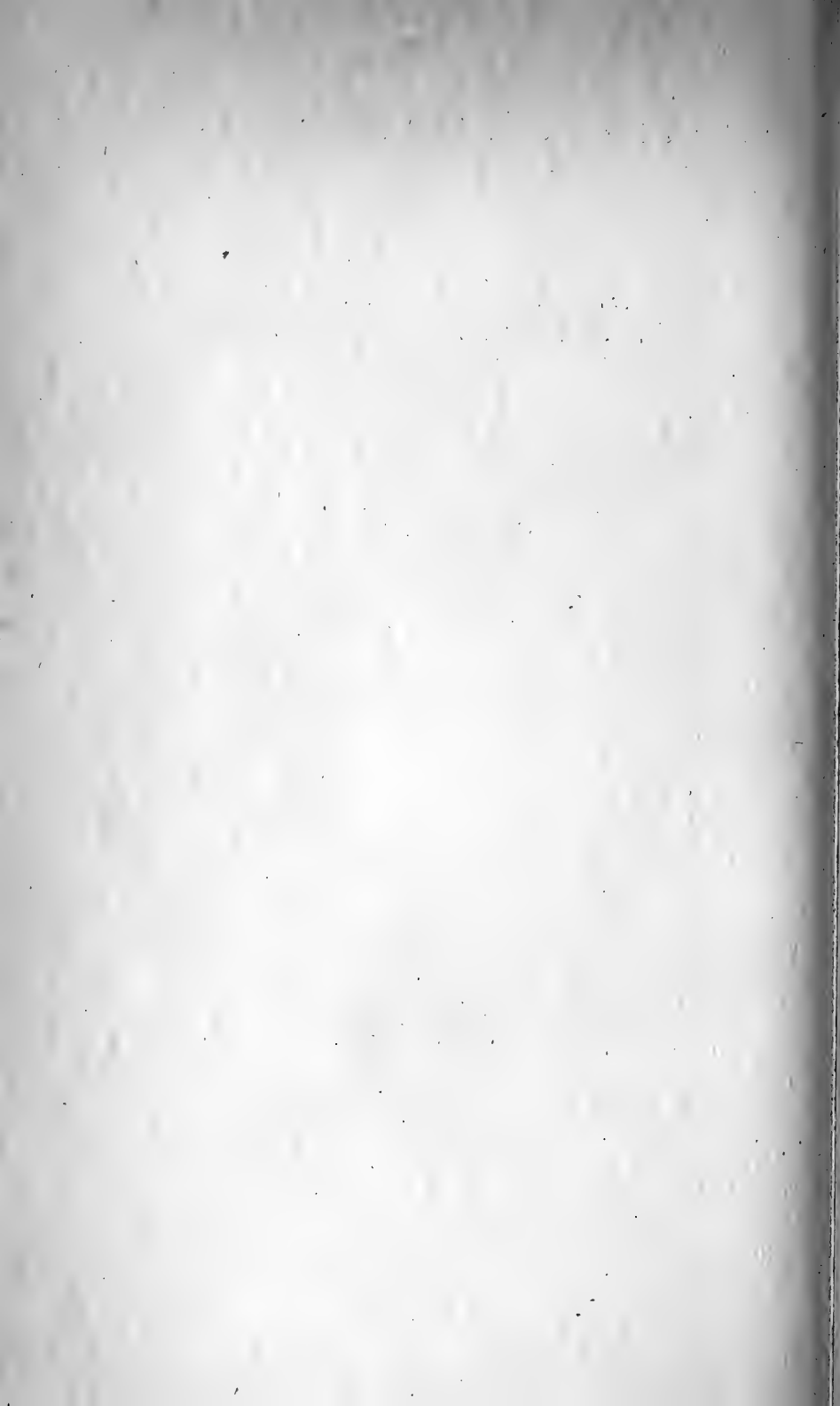
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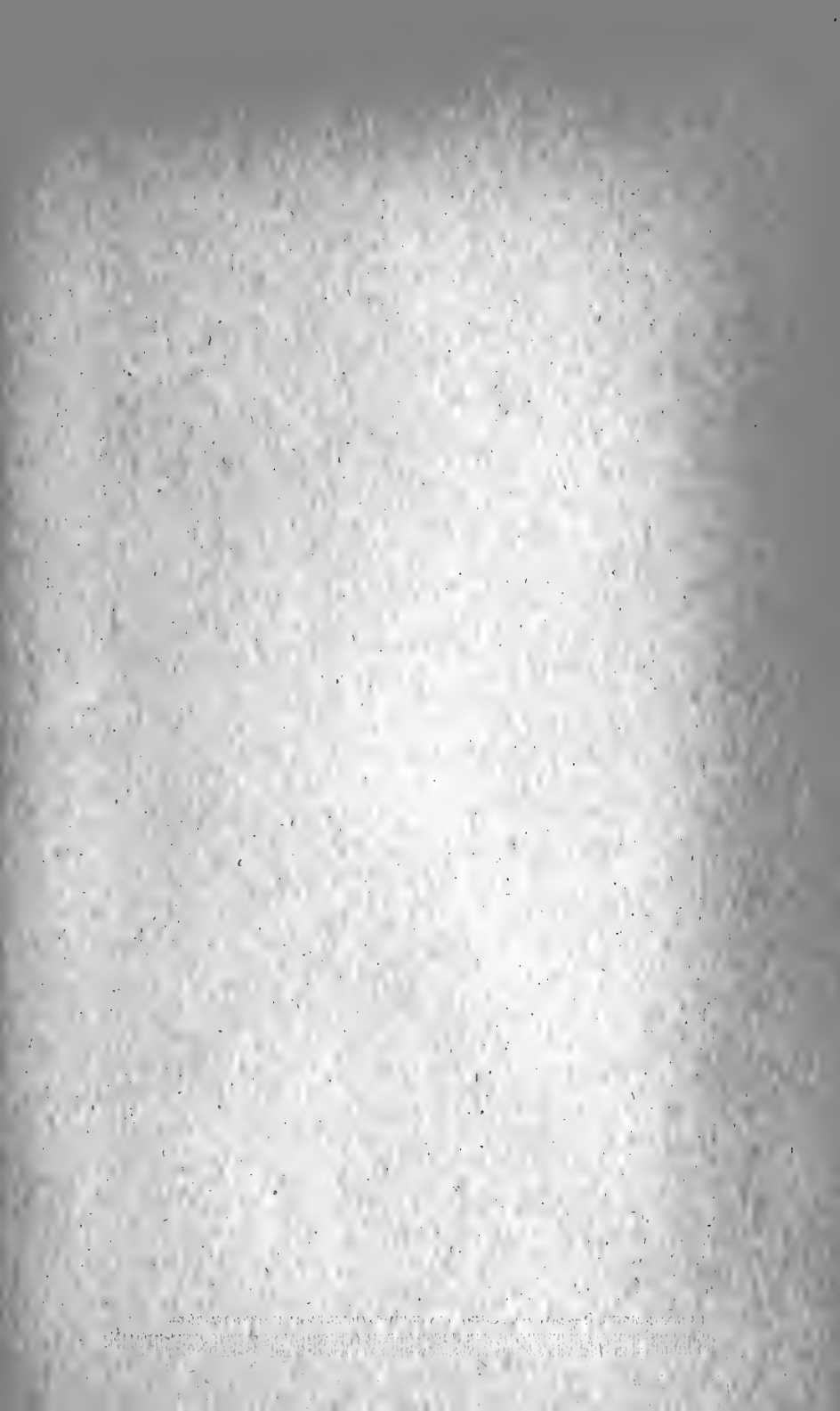
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